
BRAIN
MIRROR
BRAIN
Neuroscience and Philosophy
Ronny Verlet
MIND
MIRROR
MIND

3/22/13



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FOREWORD

Science publishes 2 million papers per year in more than 28000 journals to disseminate scientific knowledge controlled by peer reviews. No doubt that Science engineers the world's physical environment. Science starts to blows also Mental clouds in the high sky of Philosophy. Together Science and Philosophy feed Cognition. Although in quantity, Philosophy does not attract most scholars, hundred of thousand people consult yearly the website PhilPapers and merge 2 million ideas to feed new concepts. The frontier between Science and Philosophy is 'what is Life?'. The question lives since the rise of the human conscious. The answer still is a swirling stream of rhetoric and emotions, of religion, ethics, evolution, and truth. Science reinforces its dikes with Neuro-science, and the Philosophy shores its side with concepts of the Mind. Forty thousand neuroscientists produce 20000 scientific papers per year. There exist two databases of neuro databases, which, according to Wikipedia, has 50 registered storage of big data capturing neuroscience. Nearly any branch of Science has a neuro-version like cognitive neuroscience, affective - molecular, behavioral, cellular neuroscience, cellular, molecular, clinical, evolutionary neuroscience, and many more. All the knowledge is encoded in big data which

computer networks can digest. We, humans, have a small brain capacity to accumulate Cognition in comparison to the digital cloud, but we have instincts to follow, and emotions that motivate our actions. Computers and machinery never get instincts and emotions because they belong to the Mind.

In this publication, I try to convert my understanding of the many brain-mind concepts from the specialist and feed the global Mind with cognition. Doing so needs the explanation of some advanced scientific concepts that frame the current understanding of the brain-mind discussions and its evolution.

I am indebted to the global Mind, which provides all data in open sources. An individual can scan only a minuscule part of the science-backed papers. Assisted Intelligence helps to access, retrieve from raw material ideas and merge them in yet another concept. I do not know whom to thank and give credit for the intuition that guided me in the creation of this publication. No computer will ever create Artificial Intuition.

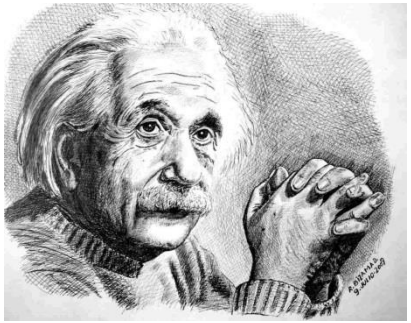
FORMAT

We think in images and language, but language is a slow and low performing transfer medium. To make the transfer of knowledge more productive, I try to catch most ideas in images and infographic layouts, keeping in mind Einstein's words: ' If I can't picture it, I do not understand it.' Because Cognition today combines more new science concepts, I feel obliged to insert at occasions tutorial-style needed to help the underpinning of the ideas.

The digital version offers more features like direct access to reference texts.

ATTRIBUTION

Attribution: scholar publications bulge from inserted peer texts that link to their ideas, or they serve to initiate criticism. Much text goes to protect against claims of plagiarism. I do not follow this course, prefer to praise the authors who inspired me in building cognitive on the subjects. Reference is given to the essential books and publications so that the reader can study the sources.



IF I CANNOT PICTURE IT, I CANNOT UNDERSTAND IT.

Albert Einstein. Scientist.

MAN'S MIND CANNOT UNDERSTAND THOUGHTS WITHOUT IMAGES OF THEM.

Philosopher -Theologian.



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In preparation.

INTRODUCTION.

Dear reader, unless you are a computer algorithm in search of words, word combinations, and sentences, we share many things. I call our common assets Cognition and Consciousness, which people assign to the privileged status of human beings, which I contest. Even a single cell organism has Cognition of how to feed and reproduce and is conscious of threat and opportunity. The humans claim they surpass the animals by being mindful of their Consciousness. Is there is a difference between mindful and conscious? Were the Neanderthalers as conscious as we are now? Are you more conscious than me? When does consciousness start in our life? What is the difference between Consciousness, the Mind, and Cognition? These questions belong no longer to the language games of the philosophers.

Science and especially the neurosciences, quantum computing, and algorithmic network intelligence take the ambition to explain the Conscious in technical terms. Remarkable is that in the intellect of mind-

brain, more scientists and brain surgeons turn philosophical than philosophers to study the brain physical and psychological. One exception is Henri Bergson (1858 - 1944), who studied neuro-science when it was still at its infant stage. Bergson's intellectual deductions match, to a great extent, the physical models of brain and consciousness of today. Bergson reduces the cloud of publication available today on consciousness to the simple statement that consciousness is a co-extensive feature of life. Life is action to stay alive, and to perform it builds on Memory as the cumulative experience of the past actions and anticipates and prepares for future work.

From this simplification, it is logic that Evolution and Cognition scaffold the neuro-sciences. Evolution is the past story of the development of life and as such of consciousness. The cumulative experience anchored in mental models and language determines the action of individuals and societies. Individual life, in the broad sense, cover from simple organic cells to the human body build of need complex material networks, and principles that generate the life function appropriate to the species. Science describes some of the life functions in physical and chemical terms; in this book, I chase an unknown spirit.

One spirit is the human drive for creation action things and ideas such as the arrow of time. Is our intellect is only evolutionary try and error for the better position in the material world, or is intuition an engine of the spirit? The power of conscious reflexion reveals the patterns of how we build cognition, namely repetition, and transcendence. Transcendence, in this context, is the transfer of a sign via a carrier to give it another meaning. The cognitive revolution started when the homo sapiens developed new ways of thinking and communication, which fostered strong social ties. Spoken phantasy and imagination nurtured the creation of fictive creatures like gods, which took possession of time and space anchored in graphical signs and art. Repetition of this process in space and time makes the development of language as a means of communication and social coherence. This is the way how the human species come to dominate the life world.

The ideas compiled this publication, need for the reader some unlearning and new learning in case the new science ideas have a place in your cognition. The primary topic is about Time. In everyday language, the word ‘time’ points to an aura of different meanings; time is a Babylonian word swirling around the ideas of repetition and duration. Probability,

relational frames, chaos, and quantum mechanics are intellectual disciplines which today, enter the cognition of the brain and its mental operations. I hope that my mental images is useful to bring the essentials across.

The human Mind has in the evolution fIrst expanded in COMMUNICATION by LANGUAGE. Now, 7.7 billion human brains expand with an Artificial material Mind. The brain operates at one Trillion times more energy efficient. By 2030, the Artificial Mind will double, but we run out of the energy to support that growth.

 **ARTIFICAL MIND**	**10.10^{20} byte** 0.4 % of the brain global capacity	**10.10^{20} Watt/y** or 10 % global electricity consumption.
 **GLOBAL MIND**	**4.10^{23} byte**	**$1.4 . 10^{12}$ Watt/year**
 **BRAIN MIND**	**$50. 10^{12}$ byte** DATA CAPACITY	**1 Person 20 Watt/hr** **or 20% of the body** POWER CONSUMPTION

Humankind has expanded its global biological byte capacity by 0.4 %, at the cost of 10 % of global electricity consumption. Will the depletion of energy resources limit the technological brain capacity?

1 A SHORT HISTORY OF COGNITION

What is Cognition?

Cognition is "the mental action or process of acquiring knowledge and understanding through thought, experience, and the senses." [Wikipedia] . In this way, Wikipedia is part of my Cognition. Reading a definition does not provide Cognition; it points into a direction to guide your thoughts. You have to make an effort to acquire an opinion about an idea; you cannot buy insight or comprehension. The word 'insight' is the dichotomy idea of 'outside,' which suggests the description of outer observables. Insight demands for how it works, where it comes from, where does it go, why such, and not so? You need to apply intellectual labor to acquire cognition, which is different from intuition. Intuitions suggest that some mysterious power provides insight. Both ideas, cognition, and intuition are mental expressions. The cognition of Cognition is the knowledge of the MIND. The Mind is a cloud of dynamically arranged concepts filled with feelings, senses, and mental data as an expression of life itself.

These domains are not The cognition of the Mind brings together many domains of knowledge like linguistics, neuroscience, psychology, philosophy, anthropology, biology, logic, and computer science all strictly scientific, which means that you

follow the scientific ritual of hypothesis, experiments, reproduction, logical deduction, and consistency with other ideas and over time. From this view, cognition of the Mental never carries the label of Science.
The events observed from Evolution cannot be repeated, so you cannot experience; all you can do is search for patterns of appearances. Philosophy only charms by consistency in thought, psychology tries hard to experiment and create concepts, but seldom they last a few generations. Biology and Neuroscience made a quantum leap step in the last century thanks to the efforts to stick to the scientific ritual. The MIND, as a holistic and mystic idea, has retreated by the cognition of NEUROSCIENCE. However, is it so? Science shivers when it hears the word feeling, and that is what the BRAIN produces to make the Mind. You could claim as well that the Mind creates the material brain to support the Mind. Let's keep far away from these philosophical speculations and focus on the Cognition.

In the recent decennia, Cognition gets a considerable boost by Artificial Cognition Intelligence and its handling of Big Data, which helps a lot to understand the functioning of the brains. However, in the end, we question if Artificial Intelligence is just a mimic of the brain itself. Finally, we conclude that the cognition of the brain and mind is simply the summation of all cognition acquired in Evolution.

The end conclusion of my journey through the Mind is that all the time, we look into a mirror, which is a philosophical statement to say: we do not know what the mind is because we are the Mind.

The only laws of matter are those fabricated by our Mind, and the laws of the mind are fabricated by matter.

*Ja*mes Clerk Maxwell.

The chief character of the mind is to be constantly be describing itself.

Henri Focillon.

The Mind is a product of Evolution. The Mind creates Evolution. The Mind holds all cognition. The journey along Evolution is fascination. Neurosciences add a new dimension to the human cognition. Neuroscience is explosive when measured by the number of neuroscientists. The progress of the cognition of the mind is lesser, although significant efforts go to the concept of Consciousness. We treat the brain as the hardware, and the mind becomes the wetware, a term in biology for software. The split hardware-software is the traditional dichotomous grounding of knowledge. Dichotomy is a mental model of thought which is based on the language of opposites like –light exists because of the dark. Neuroscience constructs its models on this common framework.

Let me remind you that Science also embraces similar secrecies as Religion holds. Science is based on the ritual of Logic from which mathematics is derived. In the Christian religion, there is the fictional Holy Spirit as the variable X. Also, Science is populated with ghost concepts. A point in space and a line defined as the connection between two points are fictional. Even space and time are phantasies. Our life is organized in space and with time, but nobody can tell what these things are. All that we can agree upon is that these fictional notions help to explain 'change and motion,' which we experience all the time and everywhere (I just used the words time and space again). On this kind of super fiction of the sapiens thrives the reality of a high-technologic digitized society.

The sapiens describe the cognitive progress in what we call Evolution, and in the historical accounts of the beliefs, religions, art, and even the mental models explaining the lifeworld.

The understanding of this lifeworld has ever increased in content and complexity In one direction, the growth is in the dept of the physical and intellectual aspects of humans and their environment.

In the other sense, the complexity broadens over the interrelations of all phenomena.

The sapiens organize the primarily phantasy in what they call

CONCEPTS.

Concepts evolve with the progress of cognition and change names accordingly. Some are just a shift of older models like the grace of God which drives the world, is now converted to energy; the atom which a few decades ago was still a kind of miniature solar system is now a bundle of vibrating ghosts which appear as particle or waves depending who looks at them. Logic is the new God who knits the minds of the people. Just as there is no logic in God and the fact that Logic does not know logic makes from Logic and God a floating sapiens concepts of phantasy. But somewhere in the sapiens' fairy mind, a paradigm shift occurs, which becomes the Cognition of the Conscious. At one moment that the sapiens question their own questioning, and think about the thinking. That moment is a breaking point in the evolution of the species. This moment is comparable to the experience when a newborn discovers herself in a mirror.

The conscious of the Conscious is in the Evolution a milestone.

Before I explain what Neuroscience produces about Conscious, let's follow first the trajectory of Evolution of Cognition.
Evolution is a historical account. Activating history is a conscious moment, which means that events from the past are updated according to the cognition of the moment, making history unpredictable. New cognition interprets facts differently.

Moreover, we cannot go back in time and experience or feel the past ‘now.’ What I see or read or hear about Napoleon or Jesus Christ happens in the ‘now moment.’ I relate a presentation of data from a past timeframe with the knowledge I possess now. This is how the brain works. The act of referring two sheets of data at a conscious timeline we call a ‘now’ moment. This sounds philosophical but will become apparent when we discuss the brain operation. We interpret humankind differently than our ancestors did. The humans are no longer the creature of an Almighty God but the product of Evolution as a bundled complexity of biological hardware with information and data handling. This view is a modern concept that will change in due time, as all cognition does. One of the most stable concepts on which our cognition builds is the idea of Time and Space and its combination, which means change and movement.

Already early in the waking of conscious, the human's question who they are and with what purpose. God did not answer. The intellect tried then to split the human being into a body and a soul. In modern terms, the soul is called the Mind. The dissection of the body did not reveal the place where the soul hides, but it resulted in a high precision map of how the body performs and how we reproduce.

Today, Science puts the question: what is cognition? The technical and philosophical answers are complicated. The philosophers add the burden of using old-styled language while the modern folks are educated with infographic

language, which is concise and illustrative what makes the transfer of knowledge more productive. The ancient Greeks were the first to question the operation of the mind and the nature of knowledge. When psychology became an intellectual discipline in the mid-nineteenth century, the initial focus was on measurable behavior by experiment. Only mid the twentieth century, cognition surpassed psychology and covers now a broad field of what we guess that the Mind does.

Wikipedia's definition of Cognition is: "the mental action or process of acquiring knowledge and understanding through thought, experience, and the senses." So, also Wikipedia is part of my Cognition. Reading a definition does not provide Cognition; it points into a direction to guide your thoughts. You must make an effort to acquire insight into an idea, and comprehension is not for sale. The word 'insight' is the dichotomy idea of 'outside,' which suggests a description made by an outside source. Getting insight means to find out how it works, where it comes from, where does it go, why such, and not so, which are the dominant relations? You need to apply intellectual labor to acquire cognition, which is different from intuition. Intuitions suggest that some mysterious power provides insight. Both ideas, cognition, and intuition are mental expressions. Intuition is close to a feeling, which is the other activity of the mind, and feeling is linked to the senses and ultimately to life itself. The cognition of the Mind brings together many domains of knowledge like linguistics, neuroscience, psychology, philosophy, anthropology, biology, logic, and computer science.

Biology and Neuroscience have made a quantum leap step in the last century thanks to the efforts to stick to the scientific ritual. The MIND, as a holistic and mystic idea, has retreated by the cognition of NEUROSCIENCE. But is it so? Science shivers when it hears the word feeling, and that is what the BRAIN produces to build the individual mind and the global connected Mind.
In the last decennia, Cognition get a significant boost by Artificial Cognition Intelligence and its handling of Big Data. This helps a lot to understand the functioning of the brains, but in the end, we question if Artificial Intelligence is just a mimic of the brain itself.

The cognition of the Brain and the Mind is simply the summation of all cognition acquired in Evolution, waiting to add new knowledge.

The Mind creates Evolution, which holds all cognition, as well as Evolution, creates the Mind.

The journey along Evolution is fascination. Neurosciences add a new dimension to Cognition. Neuroscience explodes when measured by the number of neuroscientists today, but to a lesser degree about the Mind. We treat the brain as the hardware, and the mind becomes the software or wetware, what is the traditional way of cognition where dichotomy is the grounding mesh to build on. Dichotomy is a mental model of thought which is based on the language of opposites like –light exists because of the

dark. Neuroscience also builds on this classical framework. Only when the Mind and Consciousness come into the picture, scientists get stuck in the dichotomy model. At this point, quantum mechanics and wave models are breaking through the classical framework, although the translation into the phenomenon of real life is premature.
I have tried to read the many books I consulted on neurosciences from a different angle, which start with the models of Chaos and Rhythm.
Do not search for the tree of Logic in the brain because it does not operate in this way. The only logic in neuroscience is the link to Evolution, which is a Chaos process. The brain is simply the mirror of Evolution.

The tentative conclusion of my journey through the Mind is that

all the time, we are looking into a mirror,

which is a philosophical statement to say: we do not know what the mind is

because we are the Mind.

1 THE PROCESS OF THINKING.

Cognition is the result of a guided process of conscious thinking, which is different from reflexive action, routine behavior, mechanical movement, dream, belief, and other unconscious processes. I explain the ideas of consciousness after familiarization with the brain's operation. Thinking is a conscious act. A thought does not act but is a state, which we remember from a dream. Thinking is a process with a fixed, repetitive procedure emerging from the brain structure, and its operation is a mystery. Thinking became the ritual which provides the humans the tool of fantasy and imagination. In modern terms, we call this ritual LOGIC. The belief of the sapiens in Logic is so strong that it becomes the doctrine of rationality.
Logic is a 'ritual in a passing mental procession. A ritual is a behavioral pattern that addresses a mental issue in a sequential order to bring the subject to a higher spiritual level. Logic operates on different levels and media. There is mathematical logic, and language also operates according to a form of logic.

In everyday language, you put words in a sequence to make a sentence, and sentences create mental images or meaning. When you apply the protocol of Logic in language, a trinity appears. I use the word Trinity because a similar concept exists in the Christian dogma of the Holy Trinity comprising the Father, the Son, and the Holy

Spirit. You want to say something about a topic which can be an item, stuff, a subject, an object, or a source. In Biblical terms, wich we call the Father. The issue asks for clarification. The ‘thing’ has to manifest itself, what happens in the next ritual movement of Logic. A ‘proposal’ or a ‘proposition’ is presented, which connects the subject to something else. The item takes up a role or a task; it is the Son of the Trinity sent to the earth with a mission. The third step asks for an answer, a conclusion, a result that inspires and announces that something will happen; the Spirit descends.

Language is a macro processor of metaphors, and similarly is Science a macro-logic operation. You formulate a hypothesis, then you execute an experiment, and next is to draft the conclusions. You repeat the same protocol with small variations. When the results of many loops show a consistent result, then you can formulate a final determination, which eventually can become a law when it covers a broad scope. We conclude that:

the sapiens fill their imagined concepts with mental content via a ritual called Logic.

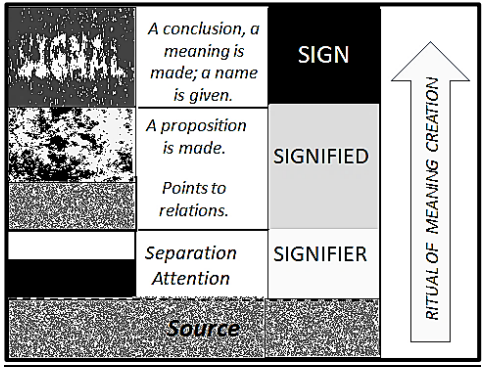
The Logic ritual is only one manifestation of rhythmic patterns in our mind and nature. Underneath there is a more fundamental rhythm of SIGN and SIGNIFICATION, which belongs to the creation of meaning and communication. Signification carries meaning. A signal is a signifier pointing to meaning. The Signifier is the medium that transports a message, like a red traffic light that signifies the message to stop. An icon and a logo signify a meaning. The medium that carries the message can be a mental picture like the traffic light, a chemical like a smell or physical like the doorbell that rings. The Signified is that, which can carry the message forward. Something stands in for another thing, and this process repeats itself. A ringing doorbell means that somebody is at the door. The bell can also ring a code with a secret message.

A sign always acts on a coincidence of time and space together. The stronger both instances are, the more powerful will the sign be. The stop- sign on the road, rules only on the spot of the crossing (space) and the moment (time) when you arrive there. The mental image the sapiens build is not a single shot; it accumulates more pictures and meanings. This repetitive process leads ultimately to the concepts of religion and of scientific knowledge. Full insight [317] Sign of Life. The life of Signs.

The lifeworld we perceive is the culmination of a ritual process that starts with the attention for something unknown, followed by the emergence in the mind of an idea or concept that points to something else to which a meaning is attached. The new idea is the start for another linkage (as a logical construct), and expansion of meaning.

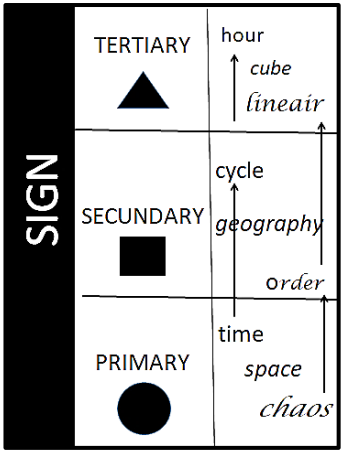
This ritual is the fundament process of cognition.

The next infographic image is a summary of the perception concept leading to knowledge. In the same way, we reconstruct the idea of Ritual, Pattern, and Rhythm, which on their term are specified from a Sign, Space, and Time.



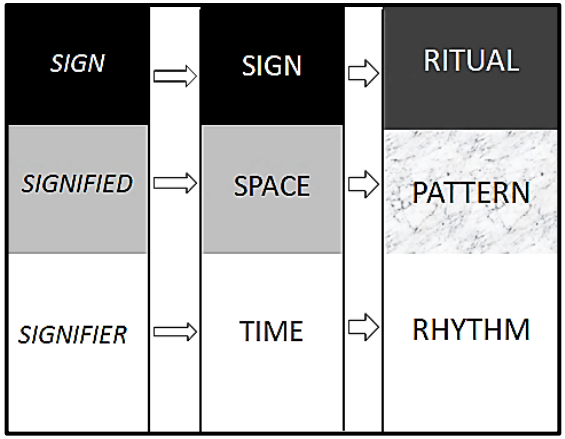
The development of the conscious starts with dichotomy oppositions like black/white. From the unknown emerge images with familiarity to other pictures. When the new image is stable, it can get a name with a meaning attached to it.

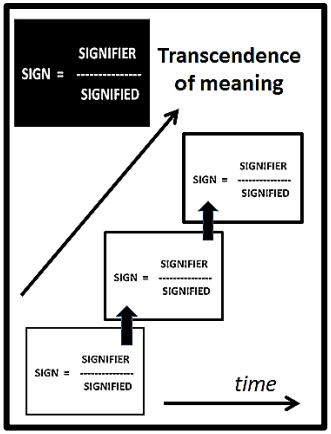
Every cycle provides a new meaning which obtains a name in language or a geometric figure or a mathematical expression or a concept. When the idea is general, the SIGN is called a Primary Sign like time, space. When the sign is transformed into a more precise view, it becomes a Secondary Sign line cycle, geography — the next transcendence results in a Tertiary Sign which is very specific like one minute, a cube.



RITUAL, PATTERN, RHYTHM.

SIGN, SPACE, TIME.





This map shows how the ritual grows from the intuition of Time and Space. All knowledge is an intellectual transformation of meaning created recurrent processes of a signifier pointing to something else and give it another meaning.

This model is essential to understand this principle of how our brain creates the MIND. Rhythm is not only a primary mechanism that operates the mind or the mental; it is also a principle that establishes the form of all material inclusive the biological. The clearest example of transcendence is the gods; beyond that, there is Mysticism.

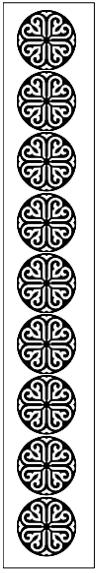
Before elaborating on Rhythm as the driving mechanism of life and cognition, let's take an overview of the total mental frame, its content as per today, and how it progresses.

1.2 HOW THINKING CREATES KNOWLEDGE.

I admit that the next paragraphs wander far from the scientific proposition, and like Evolution, only build stories on observations. Its truth value comes from the consistency of model.

The thinking process is a ritual. Let's have a closer look at what a ritual is. A ceremony holds two elements: rhythm and pattern. A pattern is a repetition in time or shape being an aspect of space. Patterns and rhythm power all human cognitive achievement. Geometrical patterns have been a unification factor, which the human mind expresses in art, symbols, and rituals. Patterns have a close link to the -'feeling' mind -, and provide comfort and healing and appeasing; probably, the designs take over the rhythmic thinking mind. Mindfulness to manage stress and burn-out builds on the control of rhythm and regularity. You do not think when listening to music. Feeling opposes thinking. Is feeling also a ritual as thinking is? There is repetition in feeling as it comes and goes in intensity. The content of feeling points to happy, sorry, laugh, anger, etc. These mental constructs do not have a space-dimension except that it happens in the mind's time. Life is primarily a matter of feelings, so feelings deserve full attention. When you ask a robot if it has feelings, it can answer

‘yes’; but it won’t feel shame that it lies or jump with joy because the robot could foul you.



Let’s have a closer look at what a ritual is. A ceremony holds two elements: rhythm and pattern. A pattern is a repetition in time or shape being an aspect of space. Patterns and rhythm power all human cognitive achievement. Geometrical patterns have been a unification factor, which the human mind expresses in art, symbols, and rituals. Patterns have a close link to the -‘feeling’ mind -, and provide comfort and healing and appeasing; probably, the designs Ask the robot what the most common fundamentals in all life sciences are? The knowledge robot will first process trillions of publications and papers from the past till now. They are categorized, classified, reshuffled, condensed, and statistically processed. There is a large chance that the outcome contains the notions patterns and rhythm as the significant shared content. The data intake capabilities of my brain are tiny compared to the big data machines, but the processing power of my mind is much stronger. To make a judgment, I rely on the answer of the robot, the intuition from my brain, or both. By the way, the robot is the product of the cumulative cognition of generations of minds, and ultimately of intuition, judgments, and actions.

All is Rhytm. Hölderlin

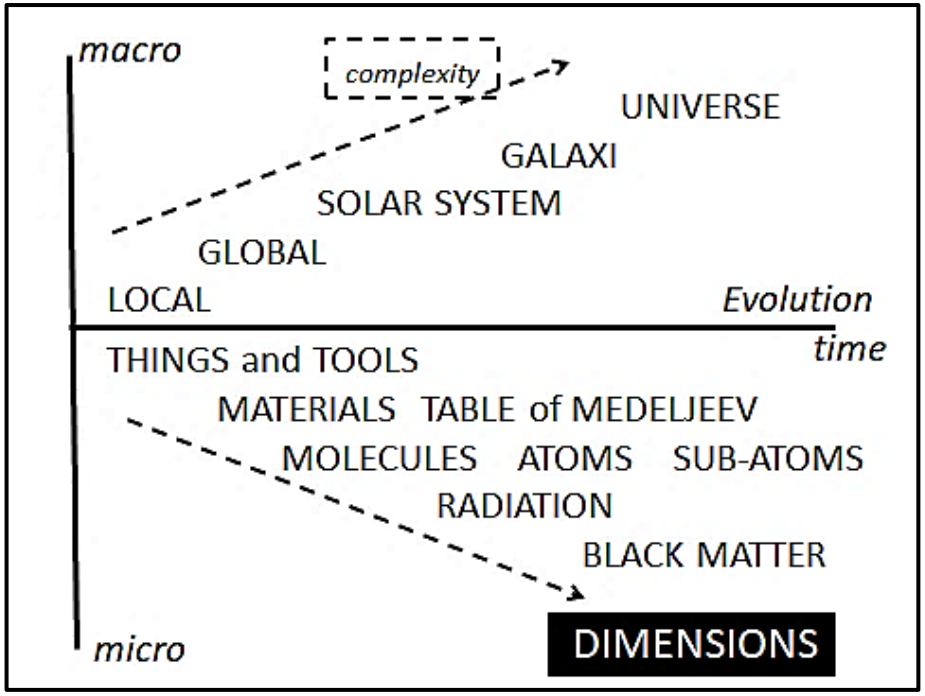
You find rhythm and patterns in all domains of science, in art, architecture, and nature as building blocks of life itself. With this intuition, I started to search for publications about rhythm and patterns. One book captured special attention (later I use the term attraction), which is a small oeuvre titled 'The rhythm of life, based on the philosophy of Lao-Tse' by Henri Borel 1921. [305]. Lao-Tze is an ancient Chinese philosopher and writer. His most famous book is the I-Ching or the Book of Change. Lao-Tze is also the founder of philosophical Taoism. Philosophers seldom bother much on rhythm. Patterns were first caught by observing the cosmos and later in biology and Evolution. In material science, we have to wait for patterns till the electromagnetic wave functions and quantum mechanics appear. Luckily, Mathematics provides tools like the complex numbers and sinus and cosinus wave functions. Till then, the rhythm was for music, dance, and rituals exclusively.

Rhythm is quantified as frequency, and cosmology was the first science to rely its research on the electromagnetic waves. If rhythm and patterns are the most fundamental manifestation of life, then we must know more about the vibrations of life and especially on what vibrations are. Here we listen to Science and Philosophy, but first, have a quick look at the end result.

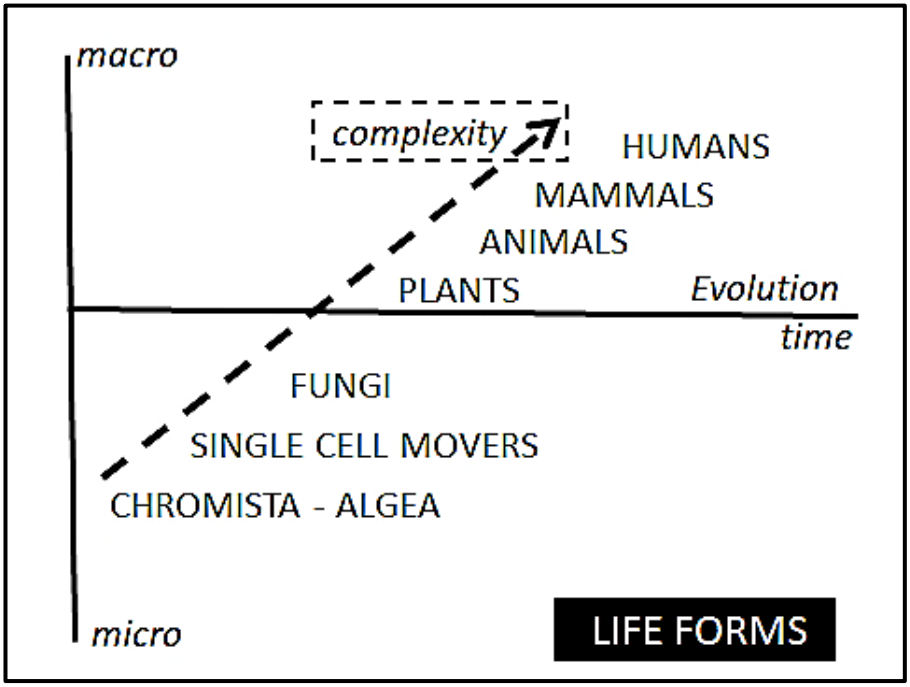
1.3 THE EVOLUTION OF COGNITION.

The nature of Space and Time will be explained later. Space points to two directions: the micro and the macro. We take Evolution as a time event for our purpose. The history of Space is a continuous expansion in size in its micro and macro dimensions, while the growth of knowledge is an explosion in complexity in time. Experience is stored in a memory activated by language, and in the tools called Technology, which emerges from cognition. The medium of cognition fills with mental images of phantasies. The sun now is entirely different from the sun of the primitive man. We cannot separate a molecule, an atom, and a black hole from the technological equipment, which helps to create the mental constructs of these things.

The map of the history of Space looks like following.



The Micro and Macro meet each other in the concept of the Big Bang, where fundamental particles packed at extreme temperature and density triggers the universe to expand and create new particles and radiation cooling to the materials which make up our solar system. From these materials and radiation evolve the biological matter of life forms and species. In this way, relate Space and Time to Complexity.



This map is a simplification of life forms that emerged in Evolution.

2 RHYTHM, CHAOS, SYSTEMS AND PATTERNS.

Let me come back to Lao-Tze's summit of the thinking process. The Tao is the endpoint of transcendental thinking, the mystic of that what we cannot know. Lao-Tze writes on the Tao.

"Tao is the source of everything: trees, flowers, birds; of the sea, desert, and the rocks; of light and darkness; of heat and cold; of day and night; of life and death; of summer and winter, and your own being. Worlds and Oceans evaporate into Eternity."

" … out of life-energy grew form, and form became birth. "

" Life is cold and empty,"

" men are as deceptive as life itself. There is not one who knows himself, not one who knows his fellows; and yet they are all alike. There is, in fact, no such thing as ' life '; it is unreal. ….. "

" From the stirring of Tao within you is Love the highest."

We can only know about the Tao because of the other concept of the Wu-Wei. "Wu-Wei, or 'non-resistance,' or 'self-movement' or the breath of impulse brought out. In every man, there is an impulse which, proceeding from Tao, urges him back to Tao again. That which is real in you, your soul, can never pass away. "

*" Love is no other than the **rhythm of Tao**. I have told you : you are come out of Tao, and to Tao you will return."*

" What your soul desires in the excitement of beholding this strange, unspeakable feeling is nothing but your oneness with this beauty, and with the source of this beauty Tao."

Lao-Tze, as many philosophers claim that what we experience is not real, only rhythm is constant. The limit of the rhythmic transcendental thinking is the rhythm itself. This statement is similar to what God of the Christian Bible answers to the question: God, who are you*? "I Am that I Am." "I am who I am" or "I will be what I will be" or even "I create what(ever) I create" "I will cause to be what I will cause to be."*

The only interpretation of these answers is that you are looking into a mirror and listening to your echo.

All cognition and intellect is a product of the collective mind made of individual thoughts over time. We say the mind is a product of the brain. As the brain is part of the body, the mind belongs to the body. Can the mind explain itself? Fire cannot burn fire, as logic cannot clarify Logic.
The mind translates the experience of the body in images, which are coded in drawings or pictures or language. This codification is required to connect to other minds. I cannot read your feeling directly, but I can guess them from what I see, hear, and how I experience you. I cannot know what you think at this very moment. Minds meet and communicate in a coded way, which means that minds belong to a kind of unified medium. Our representation of the world we live in is a product of the mind and is not necessarily the real thing. Lao-Tze claims that we cannot know the real thing, which is the Tao. We only can approach the Tao by what the Tao produces, namely Rhythm and Patterns. Nature performs the ritual relentless in the process of coming to the Tao.

2.1 RHYTHM.

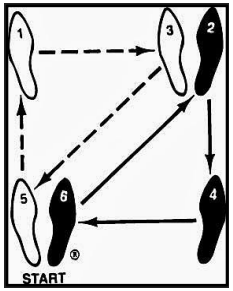
> Rhythm is what connects the most elementary and primitive bodily structures of even the most simple organism to the implacable movements of the universe itself: art, music, sculpture, painting, architecture, dance, resonates or transmits force through every structure .
>
> lisabeth Grosz, Chaos, Territory, Art.

May I invite you for a dance?

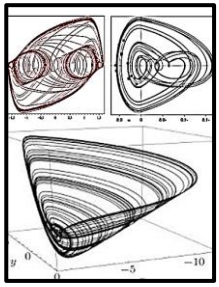
Dancing is a ubiquitous phenomenon in the lifeworld. Some animals dance a ritual for mating, and people dance for pleasure, entertainment, or as part of ceremonies to praise and please the Nation or the Gods. Dance sometimes is valued for its aesthetical attraction. Generally spoken, dance is a semiotic tool for the expression of feelings or to show complementary. Dance is a ritual of attraction, repulsion, supplement, and balancing. The movements repeat in cycles. Dance performs in a group, a couple, or single. The attractor in a solo dance is the message. Also, in the world of plants and micro-organisms, we find the movement principles of dance. Flowers attract birds and

bees with their honey. The insects, in return, carry away its pollen to fertilize the other plants and propagate the species and its diversity. The repetitive activity of attraction, complement, repulsion, and balancing appears to be a protocol of life itself. Let's find out more about this engine of life.

When you analyze the physical movements, you can register several parameters such as the patterns of the footsteps, the trajectory followed on the floor, the mirror movements of the couple's bodies. The map of your observation probably resembles phase map patterns from publications on chaos as in the nexte drawing.







These patterns are the outcome of a process powered by a set of forces. Clearly, music is the dominat actor in dance. It is the rhythm of the music that sets the pattern of the movements. A Walz creates a different flow than a cha-cha-cha. Loudspeakers that

scream too loud push the pattern on a distance from the sound source. When the couple passionately stares each other in the eyes, they might bump into other people or a wall, interrupting the smooth dance process. So, there are more actors on the stage. When we invite Newton on the floor, the talk includes forces like pull and push, action and reaction, momentum, and balance. When Maxwell and Einstein join the party, the conversation is about waves, frequencies, attraction and repulsion, space and time, energy, and symmetries. It seems that scientists do not like dancing because none ever modeled dance in a scientific concept. Engineers model dance in line with the components they design in electronics, especially telecommunication and mechanical vibrations. The keywords used are single and coupled oscillators, which describes the couple as follows: Each person vibrates on its own. Philosophers on the floor only argue on the artistic and aesthetic meaning of the dance. Not only physical music waves drive the process, also emotions released by the mind contribute; like: she wins the jackpot and starts dancing. Anthropologists interpret dance as a left-over of the mating ritual in the animal world, and Religion claims that dance is a ritual to praise the gods. Maybe, the religious opinion is the closest to the truth. Humans always have tried to associate themselves with the gods, which is in line with Lao-Tze, who claims that rhythm is the expression of the Unknown. That God equals rhythm

must frown the eyebrows. To clarify this bold statement, you first have to digest the chapter on the Mind. Let me repeat the words of Lao-Tse on the Tao:

" the Highest, the One can have no name, can never be expressed in any sound, just because it is The One. Wu-Wei, with the meaning of 'self-movement ' is the impulse born out of Tao or THE RHYTHM OF LIFE, and " … out of life-energy grew form, and form became birth; … Love is no other than the rhythm of Tao".

This is in line with the reading that in rhythm, there is no longer oneself, but rather a sort of passage from oneself to anonymity. It is also the captivation or magic of poetry and music. ' [ ]

Western scholars use the term rhythm to describe the artistic and aesthetic aspects of poetry, literature, sculpture, architecture, painting, music and dance. Some sociologists report the cyclic movements of the elements that shape a society. Rhythmic discipline and order, like in learning, act as a tool. Naturally, rhythm provides relaxation and entertainment, like in dance and music. Rhythm fosters art and social cohesion. Rhythm is all over as the mover of the mind and is a principle of Nature. According to Henri Levbre.[303]. Nature appears as a regular character with infinite transformations. When you look for the definitions of rhythm, you find that it is a harmonious recurrence of a specific element, often a single particular entity like a line,

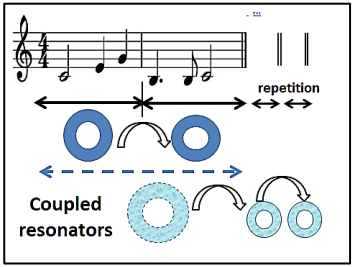
shape, form, color, light, shadow, and sound. Biology as modern science has added to the above aspects of rhythm to be ‘ the fundamental principle of the development of organic life forms and of life itself as a conscious mental phenomenon.’

Let’s return to the rhythmic elements of dance. We can start with a pattern like 1,2,3 – turn and repeat, or 1,2 turn right, 1,2,3 turn left, or any repetitive combination matching with the pace of the music. Music is a combination of sound patterns. The dancers are coupled in their movements (not only the feet and legs but the whole body) to the music. The music acts as an attractor. Not just the body synchronizes, also the melody stirs the emotions. The lyrics of a song, the light, the location, and many more things trigger the mental brain patterns of the performers. The main attractor of the dance remains undoubtedly the music. Follows more knowledge about the power of music:

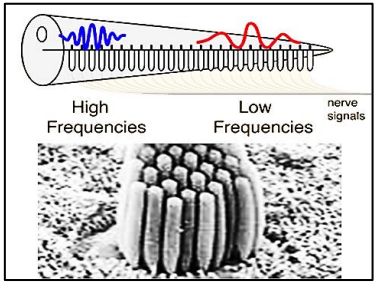
ON MUSIC.

William Pole, [307] a philosopher of Music, explains that Music is formed by a string of sounds of a peculiar kind. The tones are selected from specific elementary series called scales and then combined and arranged into a complicated structure. The composition empowers the feelings and emotions of the people, by interlocking into a beat. Music

is the repetition of patterns with slight variations, which makes us curious. We get satisfaction because we know what will come and should not worry. Music, as a chaos attractor, stimulates the human body and the mind to participate in an enclosing chaos process. It is the process of chaos coupling of the musical instruments, voices, and the person who activates the device. The player introduces personal mental feelings into the performance. Take the violin: you activate a string, and via the air, the vibration is coupled to the wooden box that generates a typical sound. The connection to the listener's ears happens through pressure waves. In the ear, there is a sophisticated bio-mechanical organ that converts the airwave in nerve signals that propagate to the brain. Here starts the mysterious process of how the mind creates a mental state of, e.g., joy, and commands the body to synchronize its movement, which we call dancing. The whole coupling process becomes a cloud of chaos manifestation. I use the word cloud because cloud computing is not much different.What makes music different from noise? Is a bird song music? The most elementary component of music is a vibration expressed as a specific frequency. We find in Nature a range of frequencies from x-ray, the light frequencies, radio signals, and the sonic and subsonic vibrations. A set of twelve



succeeding tones (frequencies fills an octave and tones can also act as a subtone. The tonic is the starting tone around which the following sequent notes fluctuate and then restart in another combination. Music is complexity with many variables from which duration and repetition define the rhythm. The complexity pattern makes the melody. When the patterns relate harmoniously, then we speak of music. Simplified, we can say that a melody is a sequence of coupled resonators where the coupling is made at different levels. The ear picks up every frequency of the tune separately as a discrete component. We do not hear a melody, but we select all momentous sound frequencies which our brain remakes as a melody. Within the ear, there are many sound tubes of all frequencies which resonate when a specific wavelength is available in the noise or music. Follows a sketch of the idea.



The processing of soundwaves to the brain is an excellent illustration of some more fundamental characteristics of rhythm and how waves, as a construct of separate frequencies, are vital to consciousness. Particular soundwaves stir emotions. The translation of music to the pallet of emotions is complicated. Some elements are explicit, like regularity giving stability, and simplicity creating relaxation. The essence

of melody is motion, and many formats are available to create this. The almost uniform rate of speed and the division in equal portions in time, create the movement. Music also has a binary character as we only appreciate specific frequency proportions. Because emotions are life, we are curious to learn from the philosophers what link they see with the life processes and how science and mathematics model repetitious phenomenon.

PHILOSOPHY OF REPETITIONS.

A Reality is something repeated. Imagine an event that happened only once and observed by one individual, even when he or she phantasy a name for it, and talk about it with the friends, it is not real. The friends can repeat and spread the news; the phenomenon does not become real; it remains an idea, which is the case with miracles. When a phenomenon occurs before the eyes of many people, it is repeated in many minds, and they can share it by a commonly accepted name, and so

> Rituals and regularities create meaning; It is the regularities in a form that frame a meaning. *Fucunni Turner*

becomes real. To a name, you can attach a meaning/ A ritual is a macro-name to express meaning by repetition.

The philosopher, Gilles Deleuze [310] , profoundly analyses repetition. Contrary to most ideas, repetition is not a concept. Remember, a concept. con-cept, is the framing of a plan to make it useful for communication and handling. A word is a concept, as money is. You cannot explain repetition by an identity having intensity or momentum or any other attribution. Take the example from Hume: AB AB AB AB AB …, is a repetition of an appearance of two attached letters as graphical signs. In the sequence, the AB's are independent of each other/ Whatever position in the series, they remain a single AB, which won't change on the number of repetitions. But, from the repeats, we can derive another phenomenon, which is 'time,' and that is a concept. The meaning we give in this series is 'change,' and it is rhythm and cadence as variations in the time scale that create explicit meaning. Rhythm and cadence are an envelope of repetitions that stirs the mind to provoke sense and emotion. It is the mind that creates change and the feeling of time. Let's return to the AB example. AB is an occurrence and the other AB's in the series, as well.

As long as our intelligence does not link two occurrences, we cannot talk about repetition, which means that repetition does not come on its own. Suppose I linearly

read the series in the way we process language, and I forget all words after reading: there will never occur repetition without memory. I also can read the AB's like an image of arranged graphical signs AB. When the signs are arranged on one line, I need space or at least one axis of the concept space, which insinuates time because of the sequence. When the signs are arranged into a space field XY, we want to clarify relations between the signs: why they are positioned as such; what leads to the explanation that repetition generates of the ideas of time and space? At least, we have now a few fundamentals which we like to relate to the cognition of the brain and mind.

Your and my ability to communicate via language is the result of repetitions. A word comes to life when a nonsense series of sounds stick to an idea, repeats, is shared and repeated by other people who align with the meaning of the word. You learn new words and language by repetition, so goes the process of cognition. The sentence which you read now is a sequence of words separated by blank spaces and specific signs as, . , ; / ?. In spoken language, we add pitch, tonation, silences, etc., which similar to music carry elements to touch and steer the emotions of the audience. The repetitions of specific words and sentences create special effects and names like an epimone where a phrase, usually a question, is repeated to stress a point. When you repeat the same word at the beginning and the end of a phrase, we

speak of epanalepsis.
The scholars of language focus nearly exclusively on the logic- mechanic structures that create a sentence. The researchers search for the gears of grammar, hoping to find for natural languages and helpful tricks for synthetic speech and automated translations.
Very few scientists investigate how the mind handles and produce language. Lots of data is available in the neurosciences on the brain regions and links where language is processed, and the motoric nerve infrastructure to speak and to hear, but this does not explain the role of language in the mind.

We can look at language from a different angle and link it to natural processes. We start with statistics. To operate fluently in society, the command of 2000 words is sufficient, although a tenfold of words does exist. Some words we use frequently and others very seldom. The scholar Michael West [416] analyzed passages from different authors and disciplines on various subjects. The total number covers 5 billion words containing 1900 common used words.

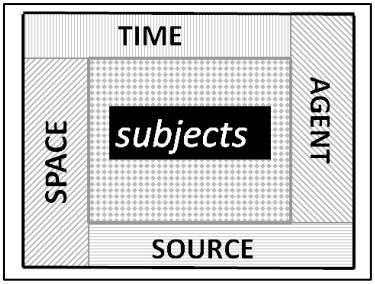
The result is that from the 1900 words, 10 are used very frequently, 100 words often, 1000 words less regularly, etc. The frequency of usage follows a power function which is a mathematical term which describes many phenomena in nature and daily life. The examples of

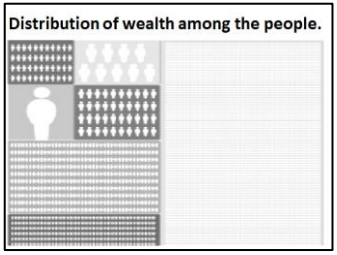
Power Functions are: 1% of earthquakes have a force of 7 or more on the Richter Scale, 10% have energy between 7 and 6, 80% have less than 4 Richter points. Another example is that 80% of the turnover of a company comes from 20% of the products. Take the wealth distribution in society, !% possesses 80% of richness.

Let's count Language together with Michael West 's 5 billion words of the many texts examined.
15 words of the total 1900 words are used very frequently and count for 15 % of a total of 5 billion words.
100 words are frequently used and count for 25 % of the total words.
1850 words are specific words less frequently used and count for
60% of a total of 5 billion words.

Take now the 1965 (1850+100+15) different words and analyze the meaning these words carry. With a bit of imagination, we can categorize the definition in 4 groups.
The meaning group 1 is words related to ***time*** as milestone words and specific moments.
The meaning group 2 is words related to ***spac****e*.
Meaning group 3 is words which have a *coupling or* ***relational*** *task.*
Meaning group 4 is words which have the task to *build the stage as background, soil, and* ***context****.*
There are some 100- to 150 different words that fit into one of these categories, and they take a total of 40 % of the total count of words in the texts. We can say that nearly half the words

that Language uses are to build the stage in time and space. The 4 groups are equally distributed each one quarter.
The 40 % of the word that fits one group is completed with 60 % words which represent an object, a topic, and subject.
A bit of more details and examples follow.





The most frequently used words are: (the), of, a/an, in/into, it, his, on, with, not, this, or, for, one, say.

The word 'the' does not play in the count because most of the time the role of this word means the start of text or conversation, or that you leave Silence.

When you take the Time-Space words the most used expressions are: A, that, in, where, there, on, by. Remarkable is here that many of these words can indicate time as well as space. Language is very close to where time and space are One.

The most words with the task of coupling, facilitation, agent, etc. are: of, by, from, for, with, on, what, why. The backstage and context words are: It (1/3), of (in relation to , as in -'of the most..'), that (the man that…), they, of (ofthe people), all, such,

any, some, what (what is it beautiful).

> Let's picture the words of Language as a field, then 40 % of the surface is taken by words that stage and manage time and space and the relations between all players. The other 60 % hold the meanings. The other chart illustrates the distribution of wealth in society, which is also a poer law.

Language creates the lifeworld and not the opposite. Pretending that Language has emerged from a lifeworld that invents words and semantic rules are false. Language is the first, and it creates reality. Some words remind us of the primary feeling of space and time, while other words picture a stage with a background or context and relations to the words holding meaning. The brain creates moments and conscious durations to release reality in a language format.

The graphics of written language is also a repetitive affair. The first characters were probably the registration of a phenomenon like the appearance of the moon or some prey. The strokes became signs with meaning, and combinations elevated the purpose and the extended the scope of application. The next image is from the very first written characters.





From the early conscious time, we can distinguish already the element of time, space (as an enclosure) relations, and symbols. Remember your first writing lessons how you had to repeat over and over strokes that made characters, what is even more explicit in Chinese writing

Now that we take some unconventional look at language. I like to demonstrate another aspect which is helpful to frame the concepts of the mind created by the brain. Every word contains its evolution just as our body is reflashing the whole organic development of life. Etymology is a stroll in the past of the human mind

Which are the first words of the humans? Of course, we cannot overhear the first meaningful utterances the first tribes shared in communication. When we look at the common roots of the many primitive languages reconstructed by the scholars, we retain a few remarkable things. The concept of life in most primitive and current languages contain the sounds f, v, w, ph, as in live, *leben, vivre, liv, vita, vida, zivot, dzive.* Definitely the first words reflect the priorities in survival referring to the sources of food, the dangers of preditors, and especially the instincts for the female and her fertility. Examples of primeval words are: *fiskaz* (fish), *flaiskaz* (flesh), *fuzlaz, fugel* (bird, vogel), *fahan* (catch, vangen), *feld, velt, feld, wald, would, woud, wildi, wilt, wild*. It is clear that they are dominated by the f,v, ww, ph sound. The old English word *wenan* (expect) has a form *to ween* (believe, suppose) and *wish, win* and *venus.* The female reference words are *faémne, feima* (maid, virgin), *fatjanan, fatia, fetian* (fetch, marry), *fula* (feel), *funon, fon,*

fonke (spark, fire), *faiman, feim* (foam, *fatan* (barrel), ***f****at* (cloathe, fashion), *vanis, vinna* (wish), *winna* (to win), *venus* (lust), *wempel* (labia), *willan* (to will), *wamba, womb, wampa* (belly, body), *wamm* (stain), *vaxa, wahsan* (to grow), *wagjan* (craddle), *waila* (good), *vaesche* (fantasia), *valsch, valleye, vaets, veyle, veynsen, vlechten, vleesch, vleyen, volghen, voechtig.* All these words can be closely linked to *wives.* The etymology of wife is linked to *weave* and *web.* Also in Daoist Chinese terms is the **w** and **v** sounds prominent as in *wuwei* (no action), *wuxin (*no spirit*), wuxiang (*formless*), wushi (*empty, do nothing, idle*).*

After the series of archaic female sound-words follows the *penetration* of the male, which sounds more rude and raw. The hard **p** and the grating **r** join the female sound-words. *Pader, pater, fadar* (vader)*, fretan* (vreten), *fro-, fra-, frja-* (fertilize, change), *fram, fremd* (strange), *fram-gangan* (frames, guide), *fra-letan* (to free), *fracodt* (evil, bad), *frag-gildan* (to reciprocate), *friznan, fra-gan* (to question), *wair, verr* (man, husband). The old meaning of -**pa** comes from the Arish language with the meaning of 'feeding'. The root -**ar** refers to ' plowing' as in the words agrarian, are, arena. Earlier, I have explained *vair, fair* as the ideas of fertilizer with *fraiw* (seed), *fro, fra, frja* as in *fraizwa* (pregnant), *ferse, frisk* (fresh), *fuljan* (to fill), *fula* (to feel), *vaer, vaerlick* (dangerous), effray), *figger* (finger), *franja* (lord). We call in the science of Language the sounds v, f, w, p, ph, bilabial referring to the joint action of the two lips that produce the sound. The hard d, t, is called alveolar. In the production of this sound, the tongue pushes against the palate.

The hard r has the name of uvular, which is created by the pulsation of the soft protrusion, the uvular. The hard r uvular movements mirror copulation. Bilabial words are crow, crack, scratch, prick, cradle, etc. The female characters dress in the velvet sounds of v, w, f, ph, and when a male is around, they attract with a perfume. Now starts the seduction by using the s and z sound, from words like hiss, sea, season, scene, syphe (a spirit}, sympa, symbol, sin, snake, snail, slime, slow, swan, swamp, sweet, swing… Note that the symbol of the s-sound curls like a snake. But can a woman sin without a man? The s, v, w, mingle with r, d, t in words like screw, sperm, scratch, sword, service, sir.

The highlights on language show the repetitious structure of signs, sounds, and the modulations that provide meaning. At any NOW conscious moment, the evolutions are mirrored.

So far, repetitions associate with sense and emotions. What about the scientific and mathematical approach towards repetitions? Science does not know emotions, only consistency.

RHYTHM AND TIME.

Time is philosophically a mysterious concept with many dimensions. Some aspects emerge from sensations like a moment, duration, and the idea of 'now.' We say that time flies, and that the time has stopped. Generally, we conceive time as the unstoppable arrow fleeing in one direction.' Now' is a crucial notion, because we *feel* in 'now.' We cannot sense in the future, and what we felt is the memory of the valuation of an impression. We remember the feeling of our first love, but we don't feel it anymore.

There exist many kinds of 'time.' There is the time as a relation between Sun, Moon, Earth, and Orion. Galaxies have their own time. These 'times' exist in conjunction with some other phenomenon that participates in the observations. One thing common to all 'times' is periodicity. An event that never repeated itself cannot have time. For example, the Big Bang does not have time as it did not happen in time, but it is the creator of time. [304]. The different time occurrences produce different names. Names related to Earth-time are: year, day, second, etc. Can you answer the question of what the time is at the North Pole? It seems as if time disappears magically at the poles of the globe. A ticking clock, how precise the mechanism is, never can indicate 12:00. It is not yet, or it is already too late. We can put many questions about time, such as do all creatures have their own time, a dog with a dog time, and the cat a cat time? Is my time the same as yours? This question is not whether we refer to the same standard clock reference.

‘Everything has its own time and things coming together will influence these specific times. Each process, therefore, determines its proper times’.

Gilles Deleuze

All thoughts and phenomena in the lifeworld follow an arrow of TIME, which is a kind of measure of CHANGE. Some changes result in ever different things, called chaos. Changes resembling each other are said to be repetitive. Repetition becomes an essential element of time. Repetition has induced the sense of counting and the numbers. A quantity or a multiplicity includes time. When we look at a picture with three apples, we see the whole in no time. Only when we differentiate what we observe, we start consuming time.

Repetitions leave a flow of time-markers. Repetition is technically quantified in FREQUENCY, and its unity is Herz, or one cycle per second. The phenomenon which consists of repetitive cycles is sometimes called a wave. A wave has frequencies and intensity called amplitude. Frequency is the inverse of time-lapse, and the mathematical expression is that the product (multiplication) of Time and the Inverse Time equals one. $T \times T^{-1} = 1$. (T^{-1} is the Inverse Time). With this formula, I introduce the mathematical notation of the relation time-frequency.

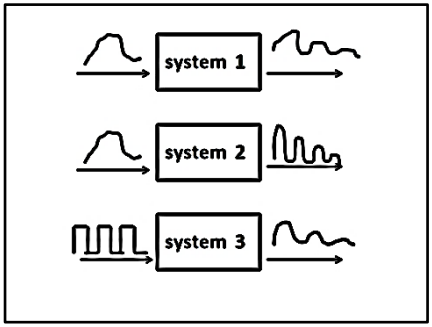
In daily life, we encounter the inverse - time as frequencies in, for example, three times per day, four pills, once per year on holiday, and eight hours per day sleep, etc. The lifeworld hides many more undercover frequency markers like the ticking of a clock, the number of lines writing the television images, the frequency clock of a computer, and your biological clock. All these elements belong to T^{-1} , which makes up the pace of daily life. Rhythm and Time play an essential psychological role, as well. When your day is stacked with time markers of too many activities, then there is no time left for yourself. This ends in the feeling that you have no longer control of your life. The surrounding consumes you, and a burnout looms. That is the psychological explanation of the formula -Time multiplied by the Inverse Time remains one.

The mathematical concept of time and rhythm is widespread in physics and engineering. The subjective view of the ‘happening’ of time, although mostly overlooked, is essential to control and enjoy individual life. You experience that the first time you walk a trajectory, last longer than the subsequent trips. We say that time flies, which is a feeling when we are engaged in continuous repetitive actions. With the time markers, your day is stuffed with a sequence of alerts, traffic lights, meetings, train schedules, e-mails, and responding calls.

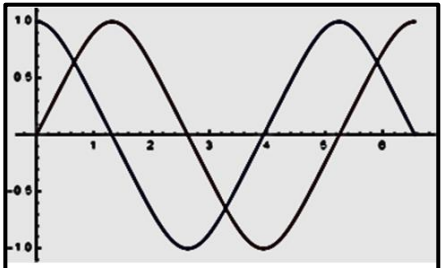
The Industrial Age, initiated by Isaac Newton, chopped all activities to the smallest details to control the processes. This division never stopped. Today, the clock frequency of computers determine the efficiency of operations and businesses of man, machines, communication, and data handling. The scientist never attaches a feeling or psychological meaning to the concepts of time. Periodicity, as a theory, is described in what is best known as spectrum analysis, Fourier analysis, or harmonic analysis. Fourier processing has become a powerful mathematical tool in communication, data processing, electronics, and material analysis, in which the link between time and periodicity is practiced. Because these concepts are essential to understand the brain, consciousness, and mind, I explain more of spectrum analysis.

The principle is the following. When you apply a force, we call it a signal, to a system, a reaction follows. The input impulse can be an event, an explosion, a knock on the door, or the clapping of your hands. The response to handclapping is sound waves that propagate in the air and heat the hands. The input can be a single impulse with a particular form or a repetitive signal. We call the output signal the response to the input. Technically we say that we activate the system, which will respond. A signal (input and output) has a shape (intensity) and a duration in time.

The theory is that all signals can be synthesized to the sum of basic patterns, which we call sinusoidal and cosinusoidal waves with different frequencies and amplitudes or intensities. The same input signal results in a different output depending on the content of the system. The relationship between output and input tells a lot about the system itself.

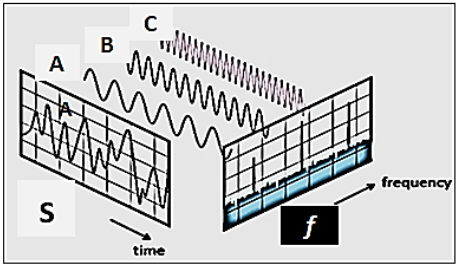


A system is not necessarily a physical construct, as it also can be a mental construct like a mood, or the mathematical concept of a multidimensional matrix of data.



sinus and cosinus wave

The concept of spectrum analysis is that any signal can be reduced to a sum of different sinus and cosine waves of different frequencies what the next image shows.



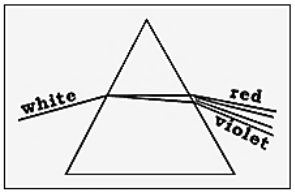
Signal **S** (in time) = A + B + C

f frequency scale with waves *fA, f B and fC*

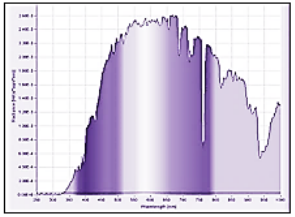
The Fourier transformation is the mathematical tool that does the translation of the time impulse into the sum of separate waves with different frequencies. The principle also applies to data analysis, which I explain in the chapter on systems, where we take sample measurements at a pace of a phenomenon. Next, you calculate the statistical correlation between, e.g., sample 1,2,3, and you make the next calculation for sample 1,3.5.7… etc. In this way, regularities reveal itself as frequencies. By finetuning the steps, you can filter more frequencies, which constitute the whole. A map of the frequencies is called a Spectrum. I show the example of moonlight and a specific sound in the next images.

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Spectrum analysis is a widely used technique in science and industry. Such as to find the types of particles in a composition. Each particle or molecule absorbs or reflects a specific wavelength, from which the content can be derived. This is the only method to measure the content of the Universe and the stars.



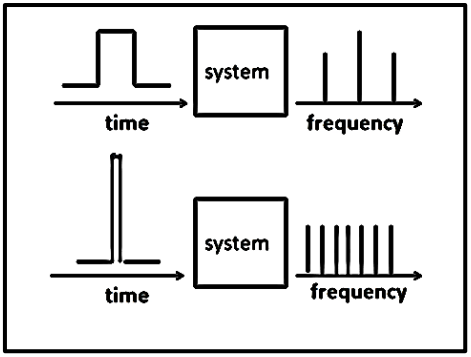
White light traveling through a prism will split in different colors. Each color correspondents to a different FREQUENCY. Between red and violet there are many more colors with an own frequency.

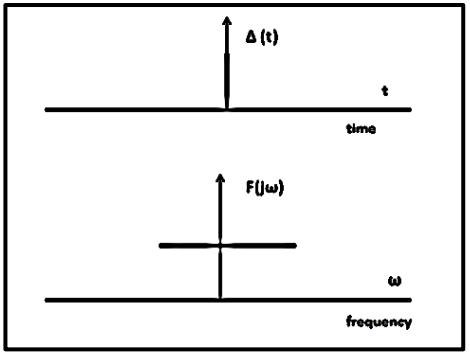


Each object reflects and absorbs specific light frequencies.
The example is the spectrum from the moonlight color.

A specific case is the DIRAC DELTA FUNCTION.

When the input of a system is extremely short in time and incredibly intense, then the output contains all possible frequencies. This can serve as a model of what happened at the Big Bang. Although the Big Bang happened outside Time (it created Time and Space according to the mathematical models), the result of the impulse is a spectrum of repetitive events of all possible frequencies.



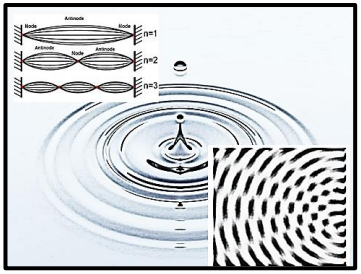


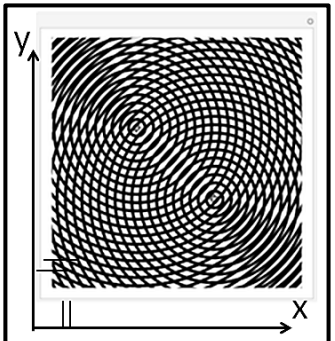
We can claim that all activities from the Big Bang contain all things and events that have appeared and will appear and happen in evolutionary time as repetitive waves. This comes to the same as a definition of time, saying that: *Time is the mechanism that prevents that everything should happen at the same time.*

You might wonder why I spend so much attention on the relation between Time and Frequency as a mathematical formula of $T \times T^{-1} = 1$. the Fourier analysis, and the Dirac Delta function. The understanding of these principles is fundamental to grasp how the brain constructs reality and sense.

Philosophers shun far from the creation of meaning by mathematics. Mathematicians only manipulate symbols and restrain from giving sense. Mathematical models serve as a tool to explain the phenomenon in real life; they only prove that data from observations fit the model.

Let me give an example to illustrate the Dirac Delta function. Take a water pond, and you drop a small pebble in the middle. The impact on the surface is a short impulse with given energy depending on the weight of the stone and the height it falls from. What we observe is a sum of waves that expand in time in all directions. The waves fade out because of the friction of the water molecules. The higher the force of the impact, the larger the amplitudes of the waves are. When the pond is a small square, the waves reflect on the edges and change direction. Now we see 'standing waves' with frequencies depending on the distance between two opposite borders. This is easy to understand because, at the side, the velocity of the wave must be zero. The reflected wave meets the incoming wave, and they add on what makes a new wave. When two pebbles drop on the surface, the waves meet and reinforce or dampen, and we see interference patterns.





Interference pattern.

Interferences create patterns creating interesting visual shapes. Pattern waves is a topic of big data. Take the example of cosmology, which is essentially a science of electromagnetic waves. The spectra become a measure for the quantification and qualification of the stars and other phenomena. We derive the distance of a star from wave data, and similarly, the expansion of the universe. The material content of the universe and composition of the stars is derived from the spectra.

Waves provide more magic phenomenon. You sit in a boat that is anchored in the water. A relatively strong wind creates waves that push the boat up and down continuously. You will feel as if the ship is moving in a direction on the surface. A 'movement' is a space-time relation, and a sensation is a process of the brain. In this example, we link a physical event with a mental feeling, a subject to clarify in the brain-mind study.

I give an example of how scientific concepts can illustrate the mental domain. Sometimes we experience an event that touches us profoundly psychologically or physically. The result is an accumulation of many thoughts, actions, and events that occur in a sequence in time. You have a car accident. The impact itself is of short duration, but the activities and steps that follow are extensive and can last a long period before everything is back to normal. The more significant the impact is, the

more consequences follow and the intenser they feel. The accident creates a mental delta function triggering your mind followed by waves of feelings. The inverse case also exists. You feel a recurrent pain in your body, and the intensity grows till moments of dizzy occur. After a third short attack of a massive headache, you go and see a doctor. The waves of feelings end in a decision. I hope that with this example, you are ready to open your mind for the concept of Rhythm and Time.

The next fundamental scientific concept that is required to grasp the brain and the mind is CHAOS.

2.2 CHAOS..

Let's rejoin the dancers in the ballroom and enter a theatre hall. The queue to buy a ticket is ordered, but then people's movement at the doors is usually chaotic until you progress to your seat in a disciplined way. We step into the room with a ritual reservation. The architecture, the decoration, and the atmosphere participate in the ceremonial feeling. The rhythm in the architecture and decorations impress and induce a sense of the enjoyment of beauty. Now look at the situation with a scientific mind, ignore the sentiments and try to model the behavior of the people, and fit it in a

mathematical concept. Cognition is arranging experiences in ideas. When an idea grows complicated, we call it a system; and a core element in a system is to find the relations between the elements that participate in the model.

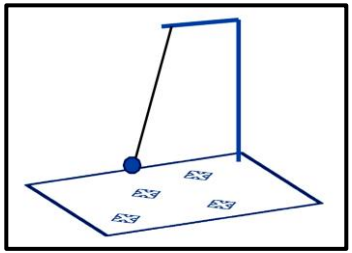
The word Chaos suggests the unpredictable behavior of a system or situation — a chaotic system changes in time, and response to influences in dynamic response. Take the example of the weather; we measure temperature, speed, and wind direction, air humidity, altitude, geographic position, planetary constellation, etc. Some settings are variable in time and are interdependent, like the gravity force of the sun and the moon. To map the changes and to predict the movements, requires the handling of big sets of data. We need a lot of algorithmic calculations to predict the weather for the coming days. Meteorology is an example of a chaos system that never comes to a stable point. In some instances, we register repetitive patterns like in winter, at the polar surfaces, deserts, where the measurements remain within certain predictable limits.

Chaos mathematics describes the phenomenon which evolves from a chaotic pattern to a more stable situation and vice versa. In most chaos systems, there are different possible outcomes of behavior. Take the example of climate change: the average rise of global atmospheric temperature can transform a region into a desert or wetland.

Such a switch leads to changes in habitats and new phenomena like floods. The direction in which a chaotic system evolves is set by the boundary conditions and the starting situation of the whole system. Sometimes the system never comes to a stable position. All may disappear like in an explosion. The dinosaurs were wiped out forever, presumably due to climate conditions. Chaos systems occur on macro and small scales. Take the example of moisture in the atmosphere. Water can take the form of ice crystals in a large variety, solid ice with different structures, liquid, and steam, depending on temperature, pressure, contamination, etc.

The primary drivers of the chaos system are called attractors and repulsors. There can be more attractors and repulsors, and they may vary in time and intensity. Other system parameters are boundaries that can change as initial conditions during the process. In the example of the meteorological forecast, the locations, size, and strength of depressions and high-pressure patterns are the starting point to calculate the coming weather patterns. The more parameters can be incorporated into the model, the better the forecast is.

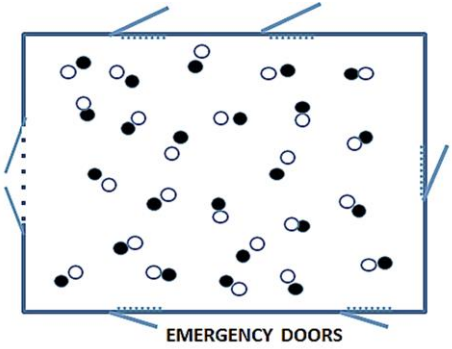
We easily can demonstrate a chaos model with the setup of a pendulum equipped with a steel point which can swing freely above a plate. The attractor is gravity, and the initial conditions are the dimensional set up of the swing, the direction, and angle at the zero start moment of swing. Newton's laws tell us that, without magnets, the pendulum continuously follows the same path, and the process ends after some time when you take into account the friction and resistance elements of the construction and the air. Now we put one or more magnets on the plate and start the same test. The path is no longer apparent. It becomes difficult to calculate the trajectories because all along one cycle of the pendulum swing, the attraction, and repulsion of the magnets influence the path. Every period is different. The result seems one big mess of trajectories. You can record the effect by putting a laser in the tip of the pendulum and a light-sensitive paper above the plane of the magnets.

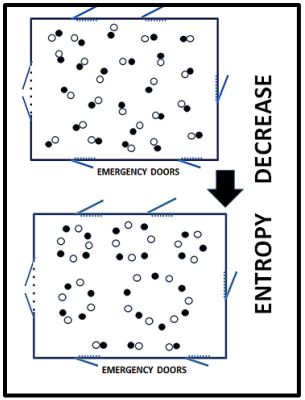


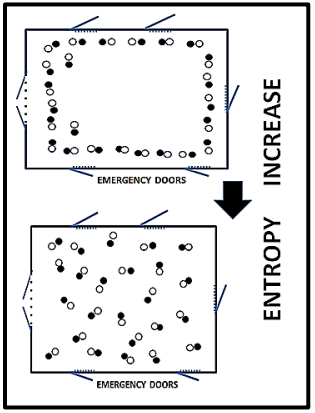
Rhythm and Balance are essential aspects of chaos systems, but these elements do not explain what causes the abrupt variations in a chaos system. We need more body for the Chaos model.

2.3 CHAOS. SYSTEMS

We return to the ballroom and consider this as a system where many couples dance. The dance master invites the couples to align around the hall for a welcome word and listen to the regulations in place. Now, we handle the room and the couples as a system. There are many ways to look at this. We can conceptualize the physical aspect of energy flows like in thermodynamics that model particle speed system, heat, and pressure. We can look for the dynamics, stability, and evolution of different sub-systems, and the balance of the whole. The second law of Thermodynamics stipulates that a closed system evolves from an orderly way to disorder or a chaotic system. The measure of this evolution is called ENTROPY. More order is less entropy, so when entropy increases, mean more chaos.



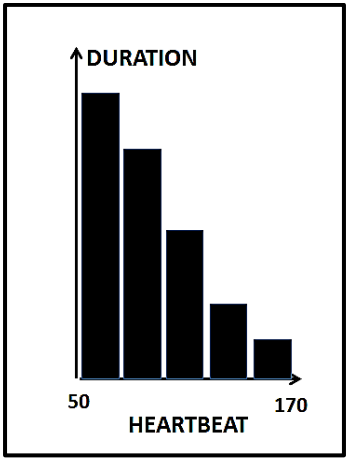




When the couples align around the room, the system is ordered. Once the music starts playing, the couples move around on the floor, and the order evolves into chaos. The master may change the music and ask to do a round dance for a specific selection of, e.g., married couples, singles, over fifty, etc. This won't change the total energetic content, but more information is available, which results in a decrease in entropy. With few dancers, there is room to move freely, and the distinct patterns which the couples run on the floor are entirely chaotic.

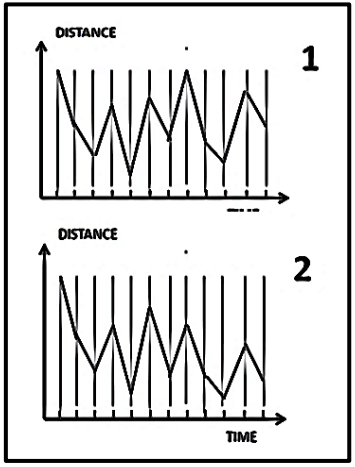
I do not expect that the pattern is different dependant on the age of the couples. Suppose now that the pairs have been formed woman and man randomly not related. Usually, acquainted people and lovers plan to be together or as close as can be. You try to minimize the separating distance to the favorite person. As scientists, we measure the gap in the number of dancing passes needed to get to the target, which of course, moves on hopefully in your direction as an attractor.

Now we consider the density. The floor is full when there is only one movement possible between each couple, which already demands maneuvering and synchronization by the couples. The system behaves differently from when we entered with few dancing people. Systems demands for quantification: one possible measure is the number of dancers at a distance. When my position is in the middle, I am surrounded by 4 people at dance distance 1, 8 couples at range 2, 16 pairs at range 4, etc., so the number is exponential.



Suppose my heartbeat increases when my eye apple comes nearer, and I map my pulse over a period, you find a graph like in the following diagram. This kind of quantitative relation, which we see all over in the lifeworld, is called the Power Law, which I have explained earlier. The power-law also gets another name like the 1/f signal-noise rule. When my sweetheart is close, our body language signals communicate clearly, while at a distance, it becomes noise. Suppose I am desperate to dance with somebody else.

The next histogram shows the quantification of this loving feeling. We can make a graph of the range which separates us in time what looks like following chart 1. Usually, the distance between the two couples is randomly distributed. The split lovers manoeuver in a way that they come closer to each other what graph 2 shows.



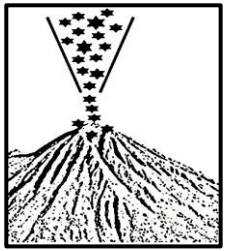
We can say that there is some intelligence in the system because the system has evolved from fully chaotic to a better-ordered phenomenon. The entropy in the ballroom decreases because knowledge has been injected, and the system has evolved to another equilibrium, which is not very visible. Now you look for the couples that discretely approach each other. One way to handle this is to compare the distance between all couples over time.

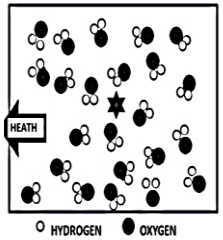
A system that comes under stress will release signs, and the task becomes what are the signs and to what of system deficiency it points? Take the example of the crowded ballroom. With plenty of space, we expect random displacements of all couples. More people enter, and none leave results; it becomes crowded; couples bump into each other. There are disruptions in the flow at random places and

moments; the system becomes critical. When even more people join the floor, you can feel the tension. An emergency can trigger the system, and people flee through the outdoors. A didactic illustration of this phenomenon is the sandpile. When you drip grains of sand on a surface, there grows a pile. The grains have different sizes and shapes, and on the microscopic level, they find an equilibrium. Sometimes grains glide, and small avalanches occur. The system still grows to a shape as if an invisible intelligence knows how large it should be. The size and number of avalanches follow a power law, and the system reaches a critical limit when all the added sand rolls from the pile, which now stops growing.

Sometimes a minor disturbance triggers the system to evolve to an entirely different pattern. A small meteorological disturbance can cause, under specific circumstances, a hurricane. This kind of trigger is called the Butterfly effect as if the flapping of the butterfly's wings creates a storm. Even when a pattern seems completely chaotic, in many cases, there is a kind of hidden regularity in the system. It happens that at a particular point in a chaos process, several options are open for the phenomenon to proceed. Water vapor can form clouds, it condenses to a liquid raindrop, or solidifies to an ice crystal making snow. We call this a bifurcation.

The images show the sand pile and a barrel with water molecules. Take heat from the container, and the molecules condense to water drops or ice crystals that grow around a dust particle acting as a disturbance to the system. Chemical processes occur similarly with catalyst molecules as the disturbance, what in biological processes is called an enzyme. All these processes run on an underlying rhythm. In the case of the sandpile, it is the number of grains added per time frame; in the chemical and physical processes, it is the vibration of the molecules that makes the rhythm.

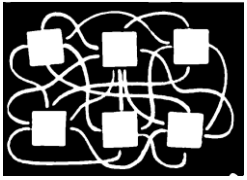




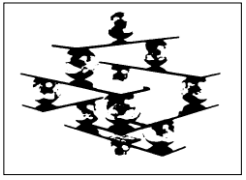
A sequence of bifurcations results in fragmented patterns called fractals. The second law of thermodynamics plays its role in many disciplines like: engines, chemistry, social systems, pattern generation. One intriguing case is the emerge of Life. How does a super-organized biological file emerge from the chaos of material particles? And how does entropy decrease shaping complex organization, where all systems strife for more chaos?

2.4 SYSTEMS. COMPLEXITY. and PATTERNS.

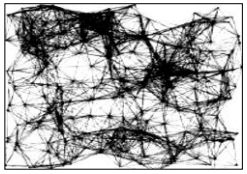
In general terms, we can say that a SYSTEM is made up of building blocks governed by principles of relations and feedback, balancing processes and equilibrium positions, quantities, and the connections between Systems, what the next pictures illustrate.



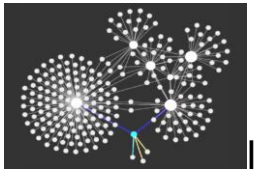
The parts make **Relations** between each other, and **feedback loops** are installed in the role of stabilizer.



The parts set up **balances** and reach **equilibrium** after a process of stabilization.



There is the management of the **Quantities** of the elements which take part in the evolution of the system.



The different **Systems** relate to each other as every system plays a separate role or has a specific task with the other systems.

These aspects come back anytime we discuss systems. Let's start with Relations within a system. The many relations may ask for a kind of categorization to support a consistency; what is the core element of a pattern.

With the PATTERNS, I introduce you to the somewhat disruptive scientific ideas of Stephen Wolfram in ' A new kind of Science. 2002'. In this book, Stephen writes about the patterns in biology, the ecosystem, chemistry, and other materials. Especially on the microscopic scale, you discover a very high regularity in simple shapes with a wide variety of patterns. The remarkable thing is that most of these geometries can be reproduced with simple digital programs that mimic Nature's design creativity called

fractals. The simple software that generates the shapes in Nature has changed the views on Darwin's Theory of Evolution of the Species. The knowledge we learn from Darwin is not strictly Science. Because the claims are deducted from observations with little experimental confirmation, the fundamentals of Darwin's theory are founded on the view of regularities and patterns. For example, you can not prove the idea of the survival of the fittest scientifically.

One strong belief of Evolutionists is that the species develop along a path of adaptation and natural selection. The survival of the species' fittest translates in computer language as – the problem of satisfaction of constraints. We can explain Evolution as: ' find the algorithm of the making of shapes that lead to a system complexity which coops best with the surrounding for energy supply, defense, growth, and multiplication. Evolution becomes, in this way, system building. Functionality for a plant means energy supply by capturing the maximum sunlight. Some cells in the plant specialize in the conversion of photons into chemicals. The shape of the leave and the whole tree has to maximize the capture of light. Another function is the defense against predators or a hostile environment. The branch of the tree develops a spine not to be eaten by animals. The subsystems work together and define new organic structures to support the whole. In this way, the complexity grows, and the winner is the species that develop the best programs which realize the optimal match with the

environment and provide dominance over the other species. The result of the development programs should not be the absolute optimal; the winning algorithm provides the highest flexibility to correct and adapt to new circumstances.

Now we look at the kind of programs that nature practices to develop a specific functionality. The most straightforward example of a feature is the shape of the species and its organs. Let's make some simple computer simulations for a shape generator.

A SIMPLE PROGRAM that creates COMPLEXITY. [404].

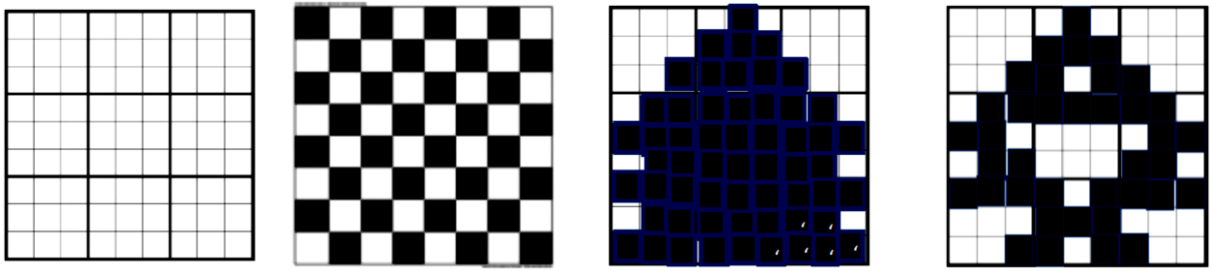
We start with the process of PATTERN GENERATION, which is a product of cellular programming. CELLULAR PROGRAMMING is a new influential tool for Big Data processing. Take a square raster as a system like a board game, and call the frame the boundary limitations. The raster squares are the sub-units that participate in the manifold of rules of the game, like what discrete steps are allowed, which areas can be occupied. Similar to chess or Go game, two players hold each one color white or black. A board game is defined by the pattern, the steps in time, and a variety of rules. One rule can be the time slot to act, or the rhythm to proceed. A digital computer program runs similarly; the clock frequency determines the rhythm of the processor. A CNN or

Cellular, Neural Network algorithm runs the same way. The choice of the name ‘neural’ indicates already that this has something to do with the brain processes.

We start with a clear cell that can be filled with content like on/off, black/white, one/zero. In case the cell has, e.g., four positions and each position can be black or white (or 1 or zero) there can be 2x4 different states or 8 possibilities, such as

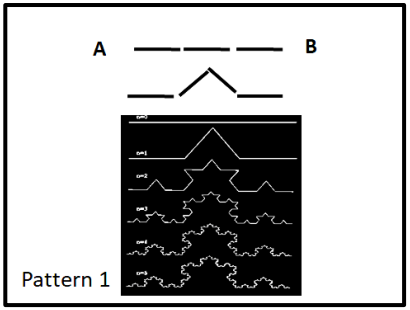


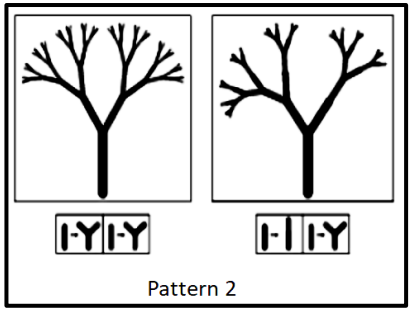
Let’s take now a system with nine cells, as in figure (1), and we simulate the eight first steps. We fill the cells with content following specific rules. Step by step, the board fills, and it is evident that the pattern depends on the rules. A step in time or sequence makes a row. For example (2) the cell fills with alternate black and white cells like in a checker game, and the rule is to change color every next iteration. The laws in case (3) are that the initial step puts black in the middle position. The following steps execute the simple rule that the neighbor white cell becomes black. When the left or right edge is reached, the cell changes color. In (4) we add a rule that when a cell has three black cells in a row, the middle compartment change to white in the next step.

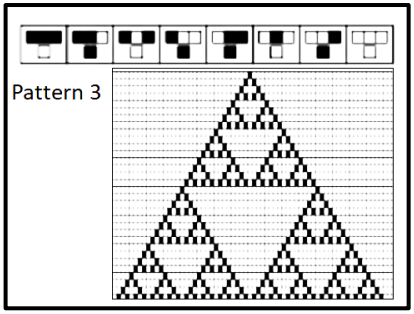


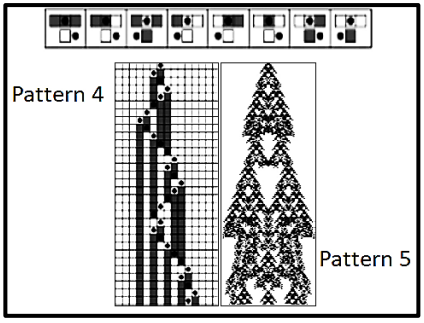
(1) (2) (3) (4)

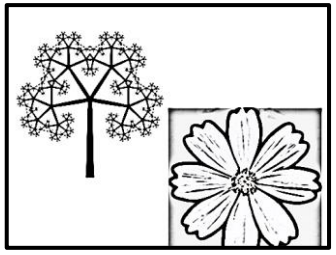
You can imagine unlimited variations in the application, and even simple rules result in a vast amount of different patterns. I give another example.
A point moves along a trajectory from A to B in a straight line, and simultaneously from B to A. A to B has a defined length. The rule is that at one-third of the total distance, there is a roadblock that we overcome by stepping aside under an angle of 45 degrees left in the direction AB and right for BA. The right and left points meet in the middle. The next step of the cell program is that the process repeats itself for every stretch of line. In the end, we walk a pattern like in the next drawing. For every segment, we repeat the same procedure until we break the program loop. This is a simple program, and the result is, of course, a periodical figure Pattern 1 because we repeat the same loop. With another simple rule of branching, you get figures like Pattern 2, 3, 4 and 5. (with permission from Stephan Wolfram. [404])..

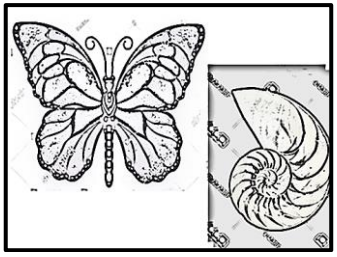








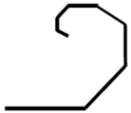




Fractals in nature

With permission from Wolfram Publications,

With these examples, it is not difficult to accept cellular programming as a mechanism in the creation of diversity in Nature. Cellular programs generate primarily two types of patterns: branches and enclosures. The biological world demonstrates branch patterns in trees, leaves, nerve systems, etc., and organs and cells as the enclosure type. The different variety of shapes that we observe in Nature are in line with the possibilities of CNN algorithms. Another example of configurations which Nature offers plentiful is the spiral design. We observe similar structures on all levels of inorganic and organic materials like the molecular structures, molecule chains, tissues, and complete construction as a snail's house.



We postulate that the species' development is driven by the functionality of their shapes to fulfill its purpose. According to scientist Gerald Edelman, neurobiology is a science where shapes recognize other forms that can fit for making more complex shapes or new functionality [-p29]. The constraint parameters in the programs for cellular biological calculations are gravity, sunlight, temperature gradient, acidity, etc. In the organic world, the functionalities matching the best other species and new surroundings will survive. We can question what the optimum is at an evolutionary step. Is it the structure that allows maximum offspring, the speed of development, size, adaptability? In the case of

versatility, viruses are on top. Every species develops its strategy. It is clear that in Evolution, there is a trend towards increasing complexity. Probably, this is a tactic to dominate the other species or to realize another purpose.

So far, the humans, win the dominance in the evolutionary process. Is the complexity of our brain the best guarantee for survival in the long term? The answer to this question points in another direction. History shows examples of dominant species disappearing because they destroy their habitat. Some CNN algorithm does not achieve higher complexity but instead target the balance of keeping many algorithmic subsystems together. The subsystems are not only organs, but you also should incorporate the environment in its micro and macrostructure. Viruses play a vital role in our body and are not only a nuisance of a winter cold. There is no answer to the philosophical question of why do higher organisms exist after all? Stephen Wolfram guesses that it is not the search for the optimum is critical, but evolution is simply the result of the extensive and continuous generation of new features (shapes) by mutations and tries and error to find combinations of organic functionality that stay in balance with the other body parts and the environment.

Historically, Science developed along the lines of causality. What exists or what happens must have a cause. The human intellect formulates laws allowing us to make reliable

predictions. But not all events are straightforward, as sometimes we see randomness and chaos. To search for the rules in the dynamics of chaotic development remains an attempt to catch causality. It is evident that the formation of the leaves of a plant, the protective shell of a turtle, and the network of veins in the human body, are the results of steps in Evolution. The development points to the expansion of the complexity of the body to better coop with the environmental conditions. The hypothesis that in Evolution, there is a 'shape generator mechanism' at work is very plausible; that's why we take a closer look at the cellular programming.

I used a simple cellular model to explain the principles op pattern generation, which, of course, can be made more complicated. The variation of rules is endless, and every new procedure results in another pattern. I have illustrated the CNN examples with black and white blocks; you also can give the cell a binary content 0 and 1 or even a number, or a gradation. A typical CNN application is the creation of grey scales in graphic design. CNN is widely used in the encryption of data. The pharmaceutical and material sciences create artificial molecules which fit a specific surrounding or get a particular function. Many modern medicines are developed with CNN programs mixed with try and error simulations. Visual face recognition is another CNN application which requires the handling of massive data. The first challenge is to find the sub-systems of, e.g., what optical parameters determine gender, age, character, mood, etc., and by what

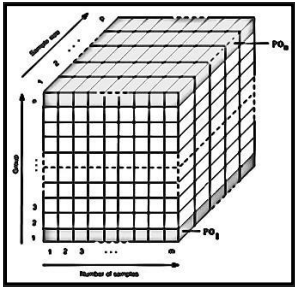
mechanisms do the sub-systems stick together (the balance element). Technically, the task is to find regular patterns in chaotic systems. Beside classified facial types (nine), there are 43 facial muscles of a person and assume that each muscle has three tensions, which express a character and a mood. The combinations which determine a person's identity and its spirit (dangerous, in panic, etc.) result in a massive number of combinations. It is clear that in such CNN application, we enter Big Data land.

2.4 COMPLEXITY and BIG DATA.

What are the principles of Big Data analysis? Data are sets of quantified observations or measurements presentable in sequential order. For example, we report measurement results of the air temperature at 5 given altitudes measured every hour of the day and at four different locations. This provides for every day a 3-dimensional matrix 24 x 5 x 4 of measurements. The week overview becomes a four-dimensional matrix.

A 3-dimensional picture of such a matrix is shown below.

1.1	1.2	1.3	1,4	1,5	1.6
2.1	2.2	2.3	2.4	2.5	2.6
3.1	3.2	3.3	3.54	3.6	3.7
4.1	4.3	4.3	4.5	4.6	4.7



Let's start with a 2-dimensional analysis and take 6 cells per row and 4 rows. Every cell contains a value of the recorded measurement. Mathematicians will check with statistical means on a large number of possibilities to find some or other correlation. For example, find a relationship in one row between the value of the positions n and n+I, and next between n and n+2. Another possibility is to shift the cell with a fixed number of steps and compare the two rows. You can check for correlations between rows and columns in x, y, z-direction. In most real cases, we take apparent relations into account; like the fact that the temperatures during the night are lower than at daytime. The statisticians have developed tricks to incorporate known correlations and how to reduce the number of calculations in the search for associations.

Crunching Big Data requires pov *N*
computing models (like CNN, q)f
predictability. Just as in the patte s
unlimited, which makes that an immense amount of analysis trajectories can be tried

out. Even in a simple one-row cell, you can look for a correlation between every other position. In practice, the statistician and computer experts use pragmatism to speed up the calculations. For example, economic trends and financial markets show historical trends that can be incorporated into the model. Big Data crunching applies the technique of encoding and encryption, compressing and expansion, pattern recognition, and image correction. The applications cover applications like virtual games based on cellular computing. Pattern recognition is a specific topic in Big Data. There exist categories of patterns to initiate the analysis in the search for a degree of match. Symmetries are a vital parameter set in data analysis, and that's why crystallography is an excellent introduction to the recognition of symmetry patterns. Spiral patterns indicate yet another type of active cell mechanism in the formation of shape and need specific algorithms.

Why this introduction in Big Data?

Nature uses the same CNN principles, and our brain does a well, and rhythm or a clock regulates it all. The biological cellular machinery is codified in a sequence of four chemical substances named A, T, G, C, which form the genes as a CNN cell. A stands for adenine, T for thymine, C for cytosine, and G for guanine. Each gene represents a functional entity which Nature has optimized to perform specific functions in the cooperation with other cells and the surrounding. The length of ATGC connected frames goes up to 1000, producing a vast number of possible patterns. A chain makes a

protein that plays a vital role in all biological processes. A protein is a chain like ATGCACGTTAGCGATC. The pattern generator of evolution withholds those combinations which are best suited for a specific task in the organic entity. There are points of bifurcation where a string includes the specialization of a particular organ. Researchers have recently succeeded in the creation of a six-letter DNA, a step towards an artificial stable molecule that can duplicate. This technique could utterly create new life forms. Evolution is a CNN rhythmic chaos process in the search for stable patterns. Science now accelerates evolution in the laboratory, because we can control the clock frequencies of the operations.

The applications of Big Data are not new. It started with the repetitive electrical signs of Morse, which launched electronic communication. Later the voice was encoded on a vinyl disk, followed by images on a compact disc and solid-state carrier. Data handling and manipulation improve quality, noise reduction, speed, the economy of bandwidth by compression and expansion, image improvement, image recognition, etc. You are familiar with the next pattern.  We expect that soon, Big Data, Deep Learning, and Artifical Intelligence disclose the mechanism of the body and the brain. Will it also explain the Mind and the purpose of life on this planet? The answer is no. The use of smart technology accelerates the discovery of the biological mechanism, but what life is, remains a mystery. One major issue with Big Data is that

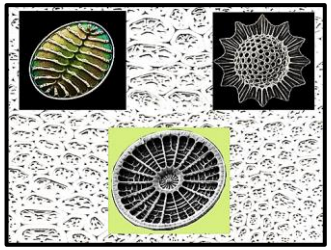
the outcome of all data cooking must be presented in a meaningful way. The word '*meaning*' here is tricky. Which intellect determines what and how the results are presented? Bias and politics play a role in all translation of data into everyday language. To attach meaning to data, and to direct the thoughts is political. Data do not generate meaning or purpose; it is the human intellect that creates sense, and men and women have moods, tendencies, and opinions. The computer programmer's mission is to convert the data into a format that allows meaning giving, and this task cannot be left to the computer.

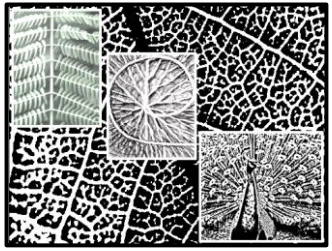
Now we try to model the birth of biological life with what we have learned about complexity and pattern generation and find an answer to the question where life starts.

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3 THE CREATION OF LIFE, A COMPLEXITY AFFAIR.

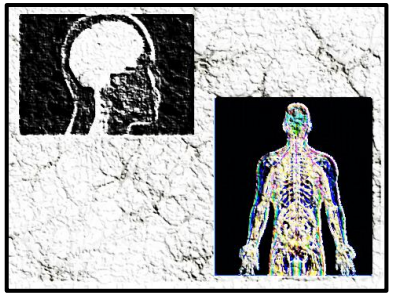
3.1 THE LIFE PATTERNS.

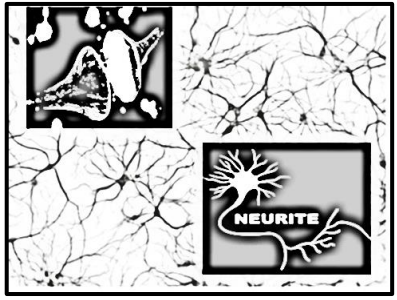




Nature is full of fractal patterns like cells and leaves shown in the next pictures.

Now we map the RELATIONS between the organs and body parts. We start connecting 78 functional organs like the heart, fingers, etc., and then we group the 206 bones with 600 muscles. Not all components are interlinked, but some have many links, and other few. The total picture is still a massive map. We can simplify the diagram by restricting the number of organs and specify functionality like the blood supply, energy distribution, waste recollection, and the information paths like the nerves.





We do the same exercise on the organ level and map the patterns. We distinguish two global categories of tree-like and clustered shapes. The deeper we pierce in each organ, the larger the QUANTITIES of parts we find. Our body counts 30-50 trillion cells, and each cell has billions of DNA strings. The body entity has to coop with a direct intermixed organic medium of 500 trillion bacteria divided over 500 kinds of bacteria. Add to this the viruses, and your system complexity explodes. Now try to add the map of the brain machinery that controls the whole body, and you get images like the next pictures of the nervous systems, the deeper level of the neurons are displayed in the background.

The similarities with the fractals of leaves and shells are apparent. Besides patterns and quantities, Complex Systems have to steer BALANCES. How does our body stay in balance? There are many balances, such as matching shapes, rhythmic movements, the

forces of gravity, friction, action, and reaction. All organs participate in a dynamic flow. To map the balances, you should think about the drawings that explain the judo and the dancing movements. When you enter the microcosmos of the body, things get even more complicated. A cell, the blood infrastructure, and the neurons are all chemical-physical-electrical factories that continuously balance their processes. A chemical molecule on its own is a composition of different essential balanced particles, what is also true for an organic molecule, or any biological structure. Go deeper to the atomic level, again sub-particles keep together in equilibrium by the physical quantum laws. All systems are in a temporary chaotic situation where the time scale ranges from femtoseconds on the atomic level to light-years on a cosmic scale.

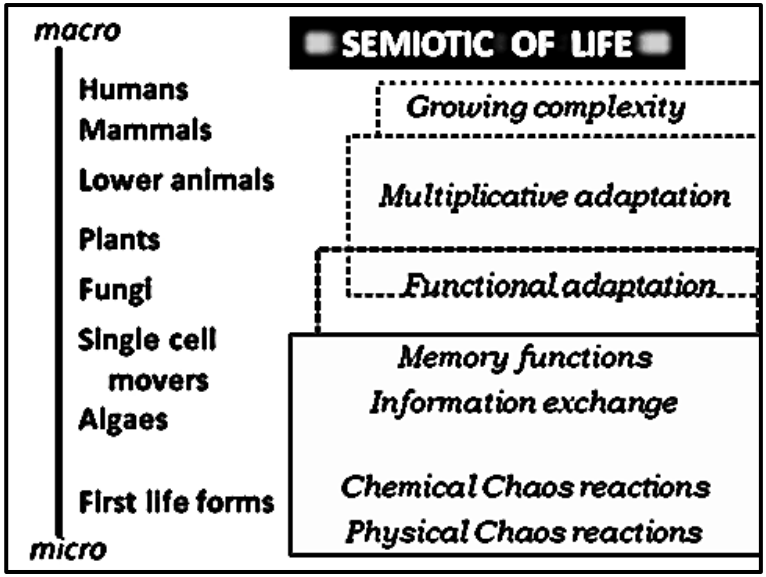
In the physical world, balances can be quantified, which is not possible with feelings and emotions. For example, your physician checks some 30 hematological parameters of your blood and another 20 biochemical markers. His judgment about your health is based on apparent deviations and the balance of the whole. In the case the complaint is psychological, de healer question you on how balanced your lifestyle is. In all areas of society, from the economy to sociology, we find long lists of criteria that require a balance to be successful. Balances are part of the definition of a complex system.

The next dimension to Patterns, Relations, Quantities, and Balances is the INTERACTION WITH OTHER SYSTEMS.

A human is a high-classified mammal living together in one ecosystem on planet earth along 8,700,000 other kinds of living species, from which 7,700,000 sorts of animals, 300,000 plants, 600,000 fungi, 36,000 single-cell movers and 27,000 chromista of algae. We, humans, live together with other people in systems of a family, a society, a political and economic structure. Each of these societies is similarly a new complex system with a *mind* that steers the whole. It is too early to describe what makes the mind. Does a system, a society, an animal, has a mind? Before we look for an answer, we first have to understand how the brain works. One thing that you have to retain at this moment is that the mind operates as all Chaos systems do.

One element is missing in the translation of the human species into a Complex System. That missing part is the language of communication between the Systems, or the SYSTEM SEMIOTICS. The applicable terms for that language are information coding, speed, bandwidth, feedback and feedforward, carrier, etc. Feedback plays a significant role in the Balances and stability. The next chart gives a generalized overview of the semiotic element of Evolution.

Evolution of Life complex systems



The first step is the chemical particles knitting stable long molecules and find matching enzymes that facilitate multiplication. This implies a kind of communication. The physical properties of the molecular ion's act as a memory in finding the best combinations to create more complex molecules. The more combinations that Nature

tries out, the better chance to see a functional link to the surrounding; the access to energy is the major one. The first process is matching patterns. The next step is molecular multiplication while maintaining stability and add functionality. Here starts the specialization into organs (macro patterns), which become building blocks for bodies that grow further in complexity. The above map is the story of the physical development of the species; the mental version is more complicated.

I have approached biological life as a Complex System. The dynamics of the systems are Chaos processes valid for all stages of the development of organic growth. But why Nature never stops that process of creation, diversification, and growth of complexity?

3.1 THE EMERGENCE OF LIFE.

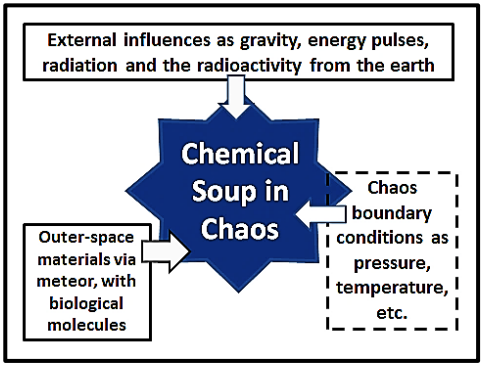
Science explains today's biological life as a self-organized critical complex system. The system has inputs and outputs, balancing mechanisms, exchange of data, and energy, and the management of complexity sub-organizations. Physical chemistry is a discipline where all these processes come together. The big question is, what triggered

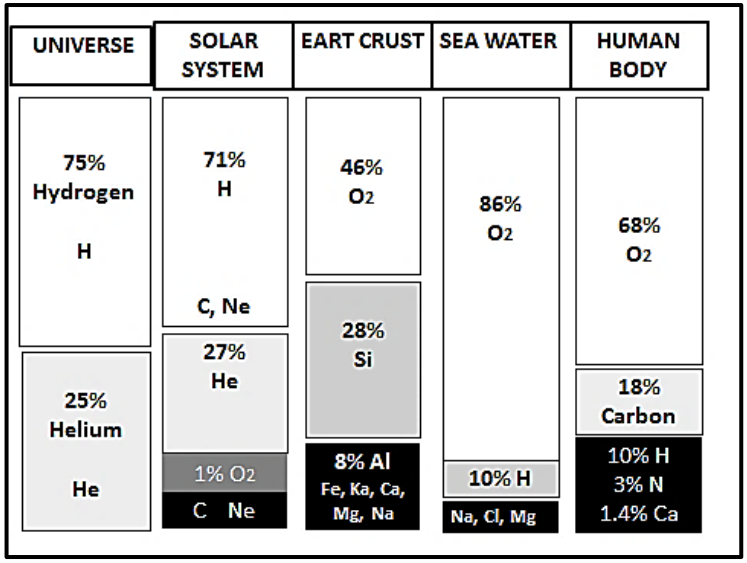
a physical complexity to become life? Chemistry deals with structures and properties of materials in all its combinations. Chemical structures are fractal patterns. Molecules, natural or artificial, are combinatorial structures of the basic elements which we find in the table of Mendeleev. The simple elements date from the birth of the universe, after which the formation of complex materials occurred. Our knowledge of the world follows the expansion of scientific models that the human intellect invents. Some major stepstones on which cognition has proceeded are the Newtonian Gravity force, Light as a window of Radiation, Einsteins' Relativity, and the relation between Energy, Light and Matter (mass), and the Quantum Sciences of Particles and Waves.

To keep the models consistent with the experiments, new concepts emerge, while technology runs the experiments needed to validate the models. In the last century, many new particles and forces popped up demanding for new theories. The birth itself of the Universe has many hypotheses. I selected the view of Steven Weinberg in his book 'The first three minutes, a modern view of the origin of the Universe.' [304]. The hypothesis starts with the explosion of highly compressed electrons and positrons at a temperature of 10^{11} degrees centigrade. Quantum and physical laws support a model where these primary particles explode simultaneously, creating sub-particles and radiation. The expansion cools down the Universe and allows more particles to come to

existence from which light as photons, neutrinos together with anti-neutrinos and bits of the nuclear materials, are initially abundant. Hydrogen and Helium follow.

The quantum processes lead to the creation of even more particles until the content of the Cosmos amounts to 75% of Hydrogen and 25% Helium. More complex materials come into existence. Clusters of matter make Galaxies filled with stellar systems. The complexity of newly formed materials grows further to structures with specific properties leading to molecules that become building blocks of the living species. The primary generator in the chaos process is forces of attraction and repulsion between the particles and the molecules in an environment with many parameters of temperature, pressure, radiation energy, magnetic fields, exchange with the outside, disturbances, etc. Under specific conditions, stable patterns of molecules emerge which make the organic matter as a building block of biological organs. The next map gives a survey of the chemical content of the current Universe and some distinct parts from which the human body is the most complex structure.


External influences as gravity, energy pulses, radiation and the radioactivity from the earth
Chemical Soup in Chaos
Chaos boundary conditions as pressure, temperature, etc.
Outer-space materials via meteor, with biological molecules



Molecular content of the Universe during Evolution.

Remark that: the material content of the human body is closer to the sea than to the earth.

Compiled from *Aspects of the Origin of Life. Edited by M. Florkin, 1960, article Bernal,* [201]

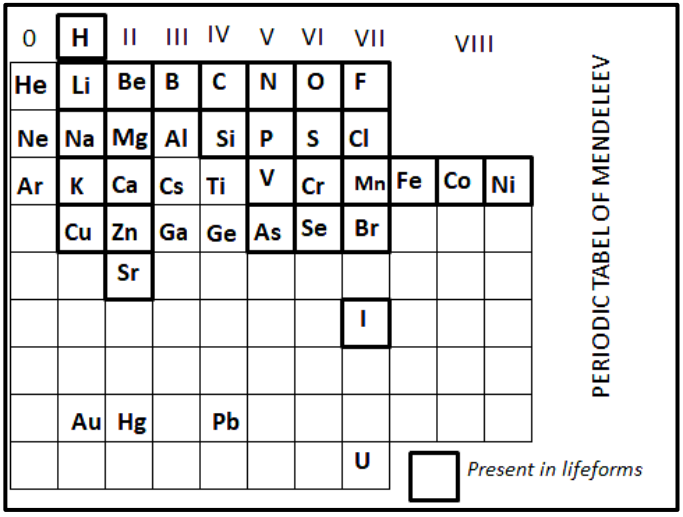
Carbon plays a dominant role in the organic material. The organic is the material structure of bio-life, a term used from the moment the chemical cluster can reproduce itself by interaction with elements from the surroundings. The formation of bio-life does not explain what exactly life is. Reproduction is only one aspect of life that needs to be completed with the notions of memory, information exchange in the form of energy, chemistry, electricity, and complexity.

In chemistry, there are many self-maintaining reactions initiated by catalyst molecules. Add a drop of lemon juice to your milk cup, and soon the whole turn out sour. The same catalyst function in biology is called enzymes. Life processes are transformations of complex molecules by catalysts and enzymes. Remarkable is that the first organic element still applies to the life complex organisms, like our bodies. *The process of evolution is not only a process of the past, but it occurs every moment in our own body, and in the environment, we share.* The underlying mechanism is the rhythm of vibrating, juxtaposed ions in search of stability.

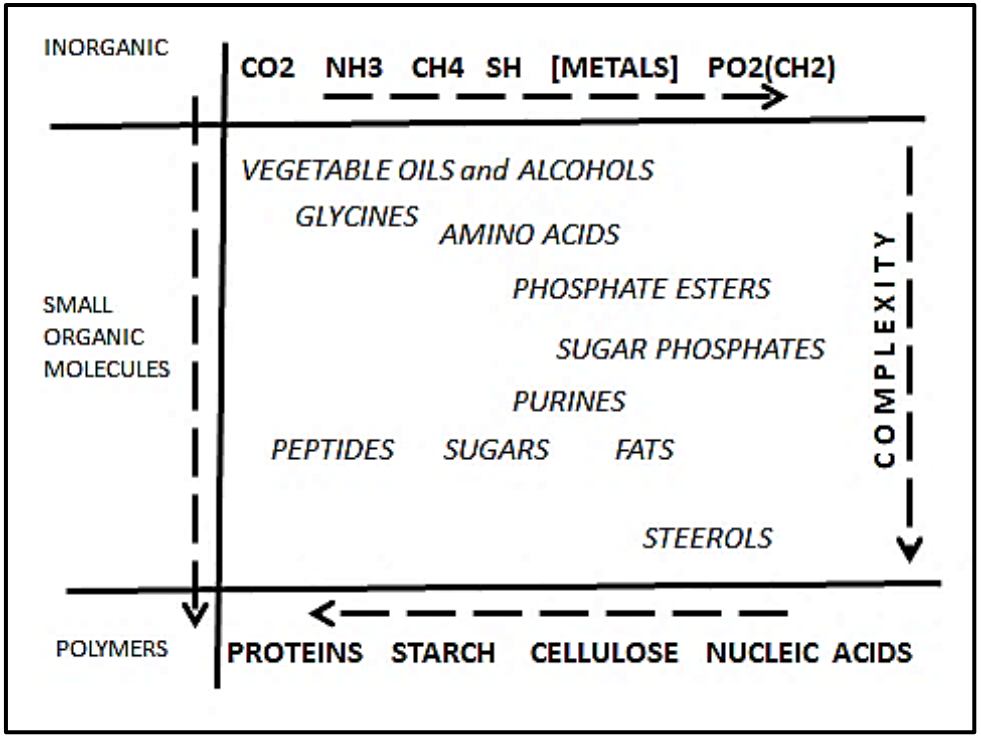
According to scientist Lipmann, the essential molecule is carbamyl phosphate OC-NH2*OPO3. The development stages of new and more complex molecules require a degree of organization and coherence.

This survey shows that from the 94 elements of the table of Mendeleev found in nature, some 28 actively participate in the mammal's biology. These elements take to operate in specific combinations in a large number of different molecules that make the organs and the nutrients for the metabolism.

During evolution, the number of bio-molecules and their complexity has grown exponentially. To these quantities, we add the synthetic pharmaceutical adds created in recent decades. The next map presents a simplified survey of the growth in time and complexity of the organic molecules which are essential for our body and our food.



The basic materials to be found in biologic life material.



Abstract out of: Aspects of the Origin of Life. Edited by M. Florkin, 1960, article J D Bernal, [201]

A.I. Oparin's book titled, 'the Origin of Life on Earth' [202], and 'Aspects of the origin of life', edited by M. Florkin [201], tell us that the organization of any living thing, even the most straightforward structure, is not only very complicated but extraordinarily well adapted in fulfilling the life functions. It directs towards the continuous self-preservation and self-reproduction of the whole living system in its environment. The Chemistry of the primary materials has evolved into organic chemistry, called the chemistry of hydrocarbons and their derivatives. Primary natural life forms named the autotrophs like algae and colonies of thermophilic bacteria, source the energy or nutrition from inorganic compounds. The higher in the development chain, the more the species rely on dead organic for food.

All living matter is organized complexity, where the sub-parts run rhythmic cycles of defined order, which constitutes its metabolism. Modern biochemistry has managed to synthesize some of the bio intermediate molecules needed for living creatures, such as vitamins, antibiotics, and hormones. Today, scientists grow even complete organs in the laboratories.
An organic molecule is not yet a live-molecule, but it is a building block to a natural live structure. The specific chemical processes which lead to self-sustaining reproduction and metabolism are very complicated, requiring good knowledge of System Complexity and 'ordered Chaos.'

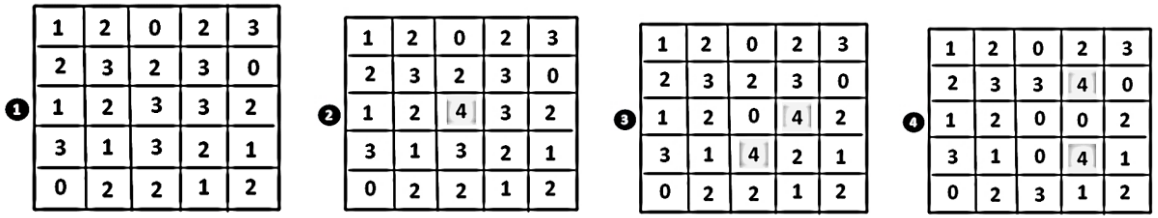
3.3 THE EMERGENCE OF LIFE FROM CHAOS.

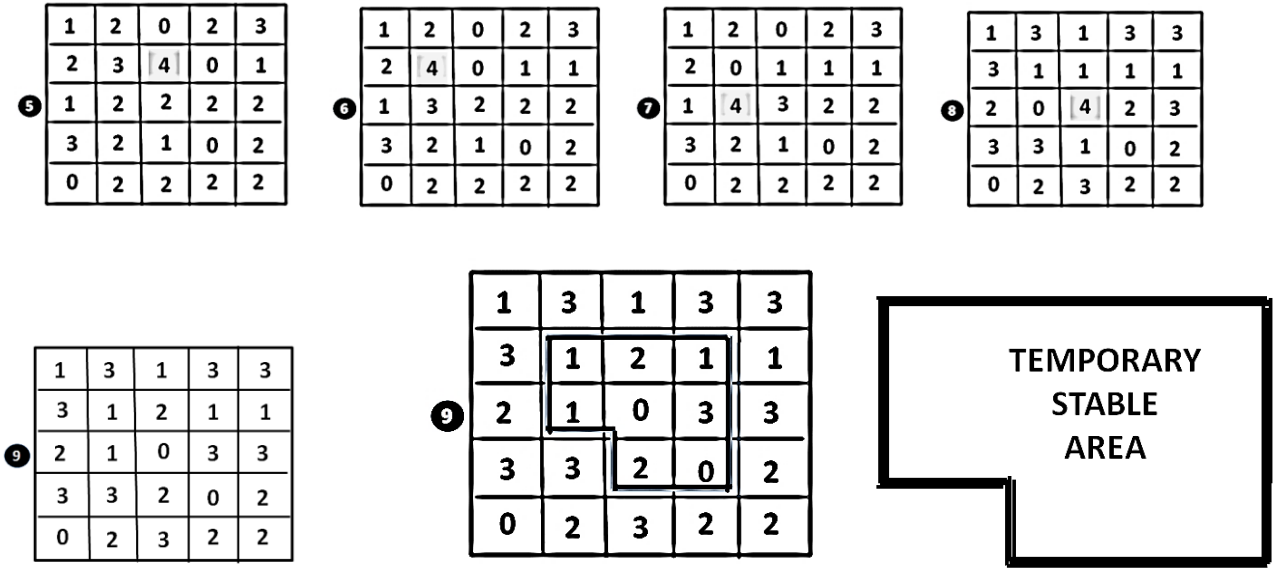
Consider Natural life a self-organized critical chaos system. A chaos chemical mixture dissipates energy in the form of power laws avalanches, as we have seen in the sand pile. Self-regulation is a high-end chaos process, which is an essential process to life systems. This condition is a particular point of the system striving for balance and stability, when the edge where the entropy increase, is in balances with a decrease of entropy. At this point of maximum flexibility; things can fall into a systematic pattern or evolve or bifurcate to another state. We can simulate the generation of patterns reaching such a critical state. It is at this point that the creative capacity for new patterns is highest. The question now is: which patterns are characteristic of biological life forms?

Per Bak did much research to reproduce the pattern mechanism that evolves into a stable situation. [414]. The sandpile simulation, as a pattern generator, comes close to the idea of life ignition. It works as follows: Take a two-dimensional pattern of 5x5 cells containing each a value or a number. The content represents stacked sand grains or documents to process on the desk of a clerk. When the quantity becomes 4, then the sand grains roll over to the four neighbor cells, and the cell is emptied, or the clerk

throws the document to his neighbors each one document and takes a rest with zero papers on his desk. At the edge of the pile, the grain falls outside and belongs no longer to the system, or the document is thrown out of the window.

I start map 1 with a random filling of the cells. Now follows that a particle is dropped from the outside on one specific cell or a document added at one desk, as shown on map 2. If it occurs that the cell has a content of 3, at the next step adding the value 1 to the neighbor cells, it empties itself. In this way, we obtain a sequence of maps or patterns. In this particular case, with the rules stipulated, the model evolves into a system containing a design that won't trigger the next step. The system is fixed until the whole process starts again by the external input of a new grain or a new document ending on a desk.





This example does not illustrate life but only the aspect of a complex system that finds itself a stable position or a fixed composition. The same model explains how

landscape forms over time and how specific patterns evolve. Biological life as a system also evolves over different stages of reshuffling its content. When you consider society as an assemblage of complex systems, it is not difficult to imagine that overload in one part result in the destruction of another aspect like the avalanches in the sand pile. As the climate conditions of planet earth reach a new critical point of stability, all kinds of power-law events can shake global societies. Scientists are playing with cellular automata to get a clue of what kind of scenarios might happen, and how evolution can unfold from disruptive events to a new period of stability.

Cellular models demonstrate only partial aspects of biological life evolution. Reproduction and mutations, which are crucial elements of the functioning of a biological entity, are harder to model with the cellular automata. Another approach to explore the life mechanisms and evolution comes from experiments with simplified chaos models. Famously is the Logistic map formula Xn+1= a.Xn (1-Xn-1) with < or =1 and a<4. This formula is often used to illustrate the evolution of a population in a system with a growth rate and limiting factors like the prey-predator population in a closed environment. I do not elaborate on this method as it is classic in the textbooks on chaos. Scientists hypothesize many system concepts and simulate dynamic behavior. The data generated in these computer experiments compare with natural

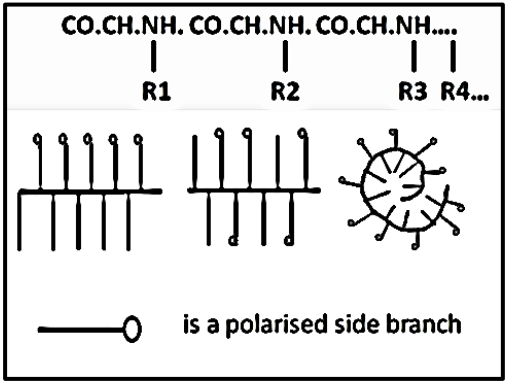
phenomena. The study of evolution being an exclusive observation activity becomes more a simulation technology in parallel to understand the underlying mechanisms.

The CNN pattern generators point to the mechanism of the emergence of biological life. We start from a mono-cell, which extends to a multi-cell organism with increased complexity and increased functionality. The borderline remains unclear when a molecular structure becomes a biological entity. The primary molecular chains arrange into groups in interaction with other clusters to form a body, which is a match of shapes. This body-entity can evolve to a plant or an animal species, with on top of the complexity of the human body. Our top position by the complexity and functionality comes from our brain. Biological entities communicate with each other in their surroundings, which is also true for any chemical structure. How far the communication stretches, or how deep the entity can probe its environment, depends on the level of achieved overall complexity. Human societies probably have the most extensive reach because of their languages, social organization, and technologies like the internet. But, complexity is not a guarantee for survival; viruses or bacteria might still win in the end. In case the humans are wiped out by a nuclear catastrophe, we know already the winner.

A collection of biological entities form ecological families. The match of pattern leads to a great variety in appearances, and the organization and communications serve the wellbeing of the colony or species. Languages are the information handling that steers the interaction of all sub-systems of the body cells, organs, the species, and the environment. We call the overall macro-language Semiotics. Biological Semiotics is a system of signs created by physical, electrical, magnetic, electromagnetic, and chemical processes that serve the biological entity. The brain nerves communicate in a well defined chemical-electrical way. Organs have their sign-language to communicate with other organs. When you are hungry, your metabolism system triggers your stomach; the blood prepares for selection and the transport of nutrients. The brain controls and coordinates the whole. The mind (I still need to explain what the mind is) steers the brain's action to find the food that benefits the body best. The chemical receptors of your tongue prepare to check the conformity of what you chew with the physical requirements. There is an entire exchange of information ongoing on many levels fitting into the rhythmic chaos processes of balancing acts in time frames.

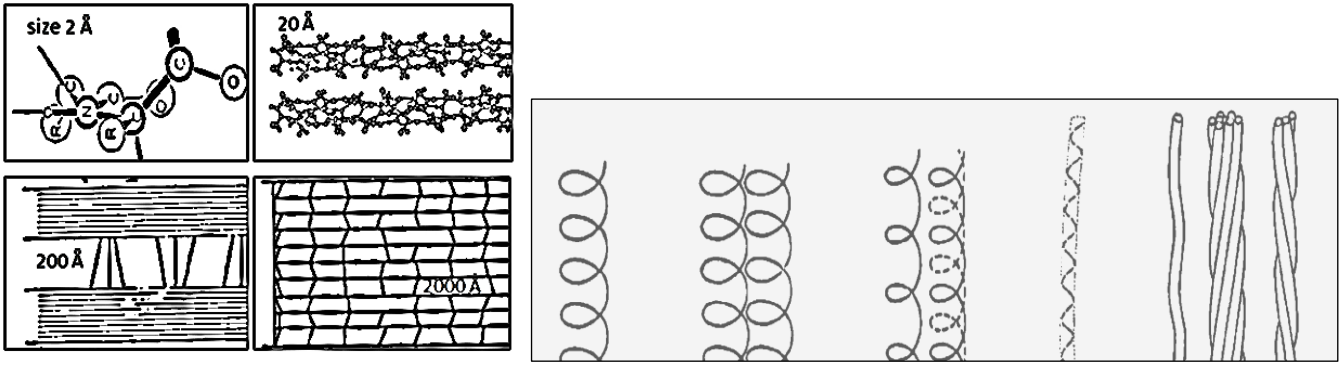
3.4 THE BUILDING BLOCKS.

The construction of the physical life-building blocks is similar to the CNN Cellular Neural Networks, building an unlimited number of possible configurations. The first complex life structure starts from the chemical structures of mainly the Proteins. Proteins are the dominant biological bricks and are available in a broad diversity. The fabric of a protein is a chain of simple repetitive groups of chemical elements which connect to the outer environment via free atomic groups (that react via ionic forces) R1, R2, … having different chemical properties like acids, basis, alcohols, phenols, etc.



The large variety of R's, the position of the R in the chain, and the combination of R's creates a vast array of possibilities of proteins to react with the surrounding and build via the chaos processes a stable molecule with a specific biological function.

When the chain becomes long, it is easy to understand that the whole curls following to the polarized clusters. Units of a reasonable size cluster to form a higher-order structure, similarly as building with Lego blocks. Nature creates its structures following the available probable solutions that can match the physical and chemical laws and reach stability or balance in a chaos mechanism. Starting from the helical basis we get following all kind of strings.



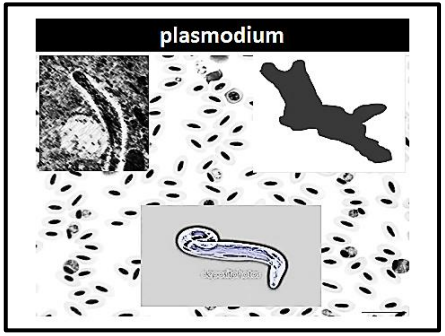
In this way, life starts from a physical-chemical mechanism of inorganic compounds that knit organic structures. The starting point of life is when the properties of the material clusters give rise to life functions of duplication, sustenance in the specific

surrounding, intake of energy, and communication. The variety of possible cluster combinations and reactions, resulting in ever more complex structures with particular properties. The physical-chemical interfaces with the environment act as the semiotic information channel with the exterior. Complex structures specialize as organs that serve a higher aggregate or entity. Structures, complexity, balance, information exchange, the dynamical adaptation, and regeneration convert to life organs. The brain is not different, which I show in the next chapter.

The step towards the Mind is COGNITION, which requires CONSCIOUSNESS.

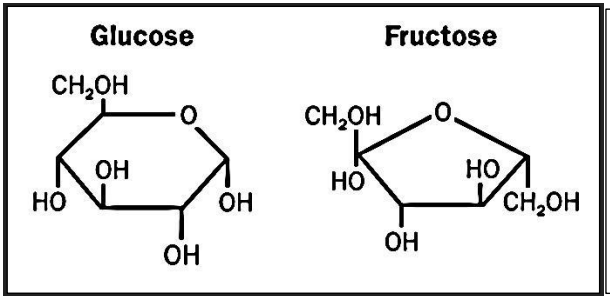
Biologists have, in the last decennia, clarified a lot about consciousness. It should start with the definition, but as with the concept of time, there are many. Let me explain how cognition is a step towards the conscious. The publication 'Slime mold: the fundamental mechanisms of biological Cognition, 2017', [200], is an excellent introduction to the understanding of the conscious. This book concludes that mold or fungus is capable of performing an incredible list of cognitive tasks. Slime mold shows outstanding creative abilities to adapt its protoplasmic network to varying environmental conditions. It solves tasks of computational geometry, image processing, logic, and arithmetic. The adaptive actions are solely based on binary

configurations of attractants and repellents as the rules that generate the next CNN step.



One stage of the slime mold is a plasmodium, which is an organism of a uniform structure that can grow centimeters and is known under the version of unicellular parasites like the one of malaria.

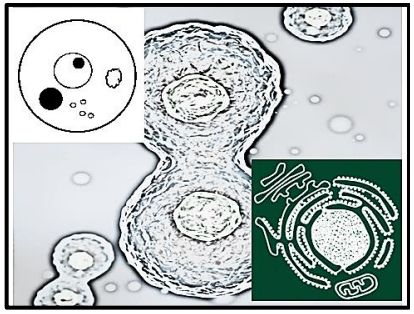
The higher development speed of superior organisms is because higher living forms find their food in the lower species and decayed organic material, which contains already more complex molecules. Another probable contributor to life emergence is dissymmetry. Two molecules containing precisely the same atoms and the same groups and sequences have different properties depending on the spatial structure. Here we are back on the matching of shapes. Our hands are a typical macro example of dissymmetry. Proteins having the same biological function may differ markedly from one another chemically.



A sugar and fructose molecule has the same content of chemical elements. The structure differs what results in other properties as nutrients

The operation of living cells is a well-organized 'division of labor' between its parts. The task is to get the optimal energy exchange and to synthesize life material effectively. Take the example of the Plasmodium parasite. This plasmodium optimizes its protoplasmic network to cover all sources of nutrients, to stay away from repellents, and to minimize the transportation of metabolites inside its body. The slime mold senses gradients of chemo-attractants and repellents and responds to chemical or physical stimulation by changing patterns and generating electrical fields. The slime mold builds around protoplasmic tubes that vibrate by the thousands. The biochemical oscillators have varied modes of coupling, like in the rhythmic coupling between de music instrument, the soundwaves, and the ear of the listener. The mold organism operates in a surrounding of gradients, concentrations of attractants and repellents which make up the semiotic language of the species. They are typically rhythmic chaos

processes. The slime mold serves as a blueprint for cell functioning like the neurons in the brains of the species, and the evolution of organic patterns.



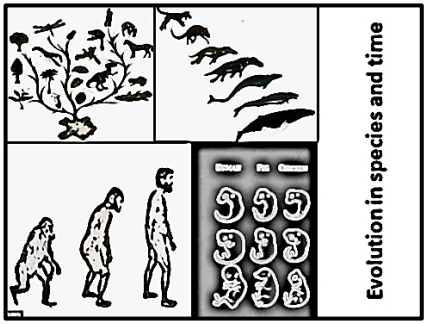
The insertion of different organic droplets as a step to the cell, and to multiplication.

A biological cell is a long chain of molecules curling to droplets which enclose a liquid soup having a particular function. The entity can duplicate by, e.g., producing internally new droplets from which some develop to complete other cells or to specific cell organs with specialized tasks. Cellular substances are encapsulated into a membrane, which again is a mesh of long molecules with defined properties. The structure and operations of biological cells are documented in textbooks of biology. What is missing is the link to Consciousness. Is a cell is conscious? At what level of aggregate or complexity can we talk of intentional behavior? To come closer to an answer, we need to understand cellular semiotics or the exchange of information between the biological entities.

The key to the development of a living system is its operational autonomy in the execution of the organism's internal and external communication. In this way, it claims that *a live system is an autonomous information processer with a purpose*, by which MEANING enters the system. The feature of purpose and meaning is also called cognitive biology. The living entity is a mechanism that acts as agents in finding food, avoiding predators, and the search for mating partners. Unique is that *the slime mold does not have a brain or a central nervous system.* Despite the lack of a nervous processor of information, the slime mold performs specialized cognitive tasks beyond the normal chemical responses to the surrounding, which is a stunning observation. The element Mind and Meaning enter here the discussions in BIOSEMIOTICS. Some biological mechanisms found in the slime mold can be reproduced in the laboratory. Computer models like the biomachine of Kolmogorov-Uspensky, which is a combined analog-digital computer type processor to simulate the behavior of living organisms. [ ]

Growing complexity asks for better communication between the sub-parts or organs of the species and with the environment. On the top level of the semiotic development is the human language, to which we probably should add the internet.

Earlier I have presented a map of the semiotic evolution. We usually consider evolution as continuous in time with bifurcations of the species to more diversity. The technology to determine the age of archeologic items has improved over time, and big data techniques help to define more links and relations. We consider evolution as a dynamic complexity subject to the chaos processes.



Evolution is a Chaos process with growing complexity, bifurcations, disappearance, new life forms evolving to ever new stable structures. The underlying process is a probability pattern generator of systems with each an own rhythm.

4 EVOLUTION, TIME and RHYTHM.

Now let's analyze the diversity and complexity in evolution. I have demonstrated that cellular programs lead to a wide variety of geometric patterns and shapes. These programs run at the pace of discrete time steps. The evolution of a specific species seems continuous in time. A dog breed doesn't change overnight. Some features might vary gradually from generation to generation due to the environment or by bifurcation caused by genetic disruptions. It is also a fact that no individual is precisely the same, and that the life span of a species is limited and different. Viruses outside the body live minutes while trees stand ages. Every species has an average life cycle and an individual lifespan. Individuals die, and new members are born. Within the body, the organs and the biological building blocks from cell to protein, also recycle at a given rhythm. Within the coupled natural cycles, one rhythm remains underexposed.

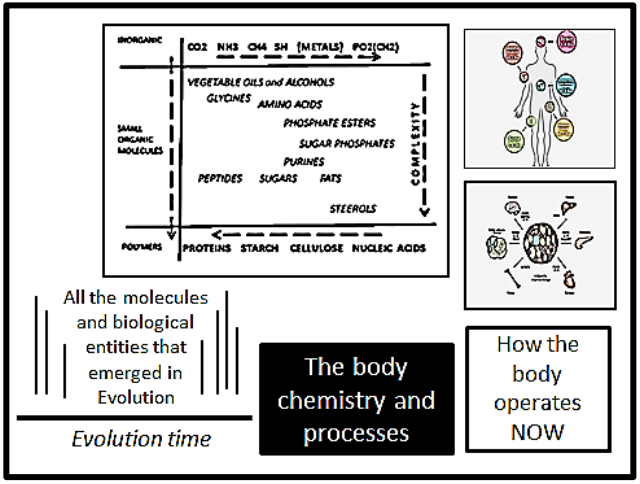
All chemicals and processes participating in the evolution of the species, continue to play an active role in today's life. I repeat the names of elementary formed materials,

which constitute the organic molecules: O2, CO2, Fe, Natrium, Kalium, Chromium, Calcium, Phosphor, Iron, larger metallic particles, oils, alcohols, glycine, amino acids, phosphate esters, sugars, purines, fats, folium acid, vitamins, proteins, etc. All these molecules emerged at a stage in evolution with a particular function. These chemicals and molecules are the leftovers of the trials of pattern generation of Nature. The selected molecules still are needed to sustain our daily biological life. *We can say that at each moment in time, our body runs the program of the whole evolution*. Not only the molecules participate, but also the processes which came to life million years ago repeat itself continuously in our running biologic cycle. Fermentation, which transfers the milk into cheese, was once an edge innovative biologic process in Nature. It remains a crucial process in our digestion system. Our organic body is the MIRROR of EVOLUTION, TIME, and RHYTHM

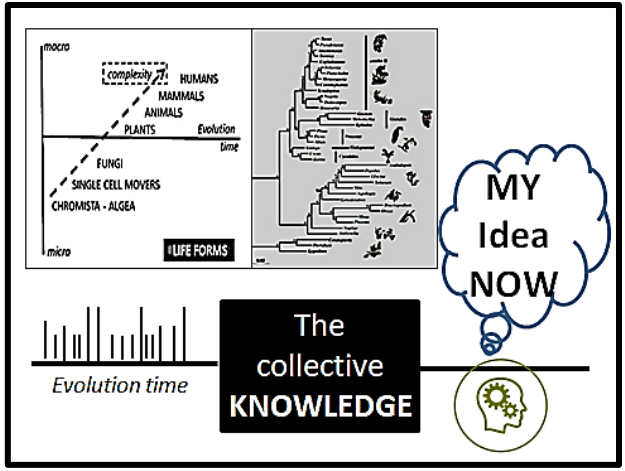
A long list of cycles participates in daily life starting from the solar system (day and night, the seasons, etc.), the biological functions (birth and death, the metabolism) from the cells to the body, the energy transformation cycles, and many more. From this view, life is a super complexity of coupled rhythmic transformation of content and shape, which promotes '*being*' to a Ritual. The bodily ritual is completed with a similar mental rhythm with spirits, mood, longing, love, anger, hope, wu-wei, and

many more. Before we study the mental waves, we proceed with the cognition of the Conscious and its links to the concept of time.

All organic life forms that came into existence in the Evolution still participate in our organic life body.

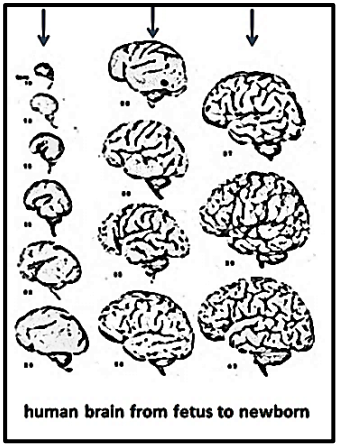


The growth from original materials to complex polymers and the living organisms that evolved in time are now stored as collective cognition of the current conscious time frame. This information is available as an idea to the awareness in the NOW moment. We consider the sum of all defined materials and species as an instant cognition resulting from an inverse Fourier integration.



All history is the interpretation NOW of the flow of memorized events.

Evolution is not a historical event; it happens at any moment as a whole. The human embryo goes from the moment of conception, through phases that reflect all species types. Your body is the inverse Fourier function of all live organic stages. The same is true for the brain. The first fetus's brain of humans is the same as from a fish and incorporates all stages of the species' brain evolution, what the next images show. The picture of the brain (Larroche 1966) and the body (Haeckel 1897) show the development of the embryo of a dog, a calf, a rabbit, and a human.





I have already stressed how the basic materials and molecules active in human biology, came into existence at a specific time in Evolution. The complexity and system performance still grows steadily. I modeled organisms and species as a dynamic system acting in a chaos mode. Today, science builds cognition of complexities on Bid Data mathematics, computer simulations, spectrum analysis, and Fourier mathematics. I choose these concepts because neuroscientists begin to describe the birth of consciousness out of brain processes in a similar approach..

5 THE BRAIN SYSTEM.

5.1 THE BRAIN STRUCTURE.

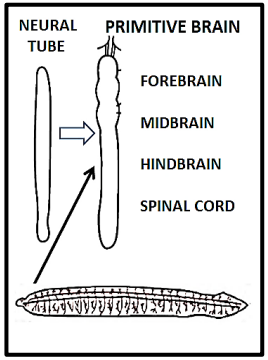
The exploding neuroscience creates a tremendous amount of data about the physical, chemical, and biological structure of the brain and the nervous systems which control the body and mind. More than 40000 neuroscientists produce yearly 20000 scientific papers. Two big- databases concentrate the neuro findings of 50 registered storage collections of neuroscience data (Wikipedia). Nearly all branches of science have now a neuro-version like Cognitive neuroscience (NS), Affective molecular, and Behavioral, cellular NS, Cellular and Molecular, Clinical, Evolutionary NS, and many more. In this chapter, I try to sketch the structure, complexity, and brain data handling produced by current scientists. The purpose is not to give an account of neuroscience, which is far from my competences but to link some fundamental principles to what might make up the mysterious Mind.

The human body, as an organic system, is an assembly of connected organs that perform the role of specialized systems supporting the biological entity. Each organ, on its own, is a complex system from which the cells are a dedicated complex sub-entity. All the system entities from small to large have an individual rhythmic operating program acting in a chaos mode to fulfill a specific task. The systems connect mainly on a hierarchical base but distribute processing is available as well. Remind the slime mold, which has no hierarchical brain processor. Communication channels between all systems of physical, chemical, and electrical design, handle specific semiotic codes, instructions, and feedback. The higher, more complex species are equipped with a BRAIN that acts as the top hierarchy in the data processing. The electrical and chemical processes in the brain and the nerve systems behave as coupled chaos mechanisms with a clock and own rhythm. The information and data structure and the dynamics of the whole system are called the **MIND**.

I try to explain the BRAIN in a few infographic maps.

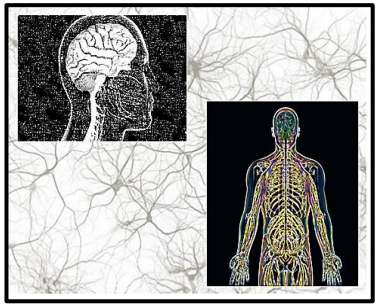
From the slime mold species' type with distributed control of its functions, new life forms developed where the command activities are centralized in a nervous system with an attached brain. Because survival in the environment demands more tasks, the brain increases in complexity and speed of execution, leading to mobility. The brain

and the nerve system remain one organ — a similar growth happens on the micro-scale with the development and specialization of the NEURONS and the nerve networks.

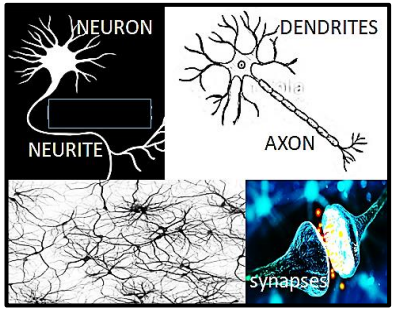


The first appearance of a brain is a neural tube that developed into a primitive brain where the parts specialize for the vital function. The forebrain senses (the smell as a chemical function) and coordinates the senses with movement function in the midbrain. The food, energy, and waste management is the hindbrain.
The species is the amphioxus, the simplest living chordate. The central nerve is a neural tube with sensory nerves and motoric tubes for simple movements.

The BRAIN, as the central organ of command, has an extension in the spinal cord and the nerve system which connects all organs. Its function is to sense the external and internal organs, take decisions, and to instruct physical movements and physical-chemical-electrical commands to the organs.



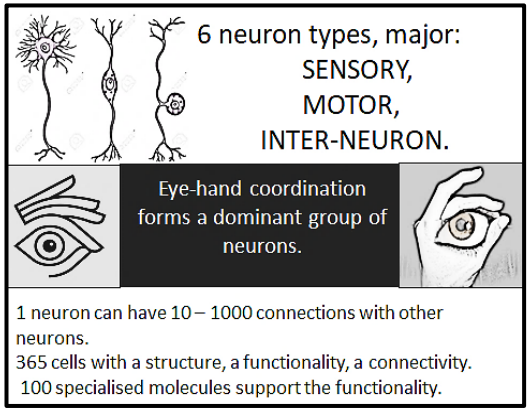
The primary organic biological processor is the NEURON.
Neurons are highly specialized cells, numerous in quantity, and extraordinarily dense in their interconnections. The highest density is in the thin outer layer of the brain's great cerebral hemispheres called the 'grey matter.' The layer beneath, the 'white' matter fills with connections. Interconnections are as crucial for the functioning of the brain as the neurons self. There are layers of specific neurons interconnected vertically and horizontally to other domains, to the nerve channels, to the organs and the highway between the two hemispheres and the peripheral nerve pattern



The neuron is a specialized bio-chemical-electrical cell which acts as a processor in a parallel processing network and provides the connecting lines with the overall system. The connections and the management of the links is part of the processing modes.

The neuron is composed of a processing cell and neurites as connecting wires. There are two types of connectors, the dendrites which are mainly sensors that feel other neuron wires, and axons with a physical-chemical structure to make the

connections along which the signals travel. These connecting points are called the Synapses. It says that a synapses fires when a data transfer occurs. This firing is an electrochemical process with a specific rhythmic pattern. The frequency of the firing is a measure of the intensity of data handling. There are excitatory and inhibitory synapses.


6 neuron types, major:
SENSORY,
MOTOR,
INTER-NEURON.
Eye-hand coordination forms a dominant group of neurons.
1 neuron can have 10 – 1000 connections with other neurons.
365 cells with a structure, a functionality, a connectivity.
100 specialised molecules support the functionality.

SENSORY neurons bring in the signals, and the MOTOR type are executors.

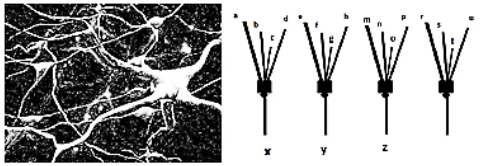
The INTER-NEURON types are mainly occupied with the management of the connections.

Recent research points to many more specialized neuron types.

Earlier, I explained the evolution of the primary biological cell to an organ and adapted its shape to the needs for food, multiplication, and defense. Motor control capability develops to the move around what boosts flexibility and possibilities to further evolution. The sensory organs, like eyes and smell combined with the

motoric capabilities, became a highly specialized functionality of the brain. Neuroscientists study intensively the visual senses and how the data is acquired and processed to motoric signals.

The neuron processor has an internal electrical potential membrane that can release electrical pulses at different locations and thresholds. This makes the neuron to an analog and digital processor. The coupling via the dendrites creates a massive parallel processor.

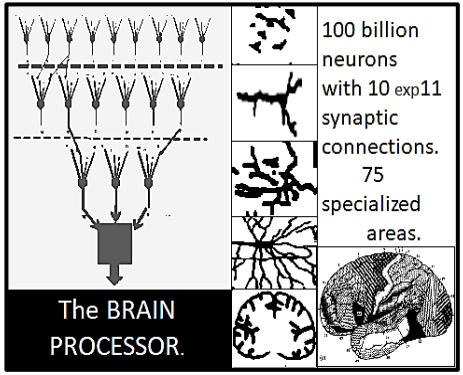


Neurons are specialised, with many inputs/ outputs
The processing of the inputs is selective: on intensity, frequency, with tresholds, synchronous with other neuron populations, with memory function, with an inhibition function.

A Neuron is a distributed parallel processor with chemical/electrical interfaces.

The brain has two parts: left and right, linked to the symmetrical body organs and limps. All controls are partially processed: in both sides of the brain's outer grey part, the inner white and the deeper sections. The distribution of the tasks between left and right, and the different domains is still a mystery. It is known that there is a

highway of 200 million axons between the left and the right hemisphere of the cerebrum.

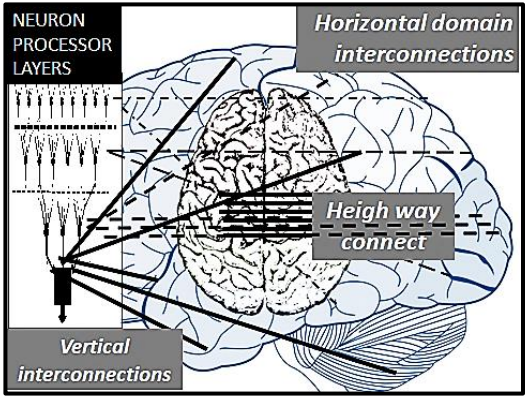


The layered structure and specific neurons make it possible to create lots of specialized interconnected parallel processors. The specialization clusters in brain areas sometimes called the Broca domains. Different Broca areas can cause a super functional processor to coordinate, e.g., sensory, motoric, and psychological states.

The neurons control of flexible connecting networks by re-weighting, strengthen, weaken, and so they redefine the patterns. The connectome can rewire and create new branches or eliminate and disable them. The core processor of the neurological infrastructure is DNA, which is a pattern imprinted in all biological material. This pattern becomes fully deployed in the life cycle from fetus to adult. The connectome is dynamically active all life, and damaged brain tissues can restore the mental deficiency caused by trauma. Cognitive and psychological experience in life makes, also create

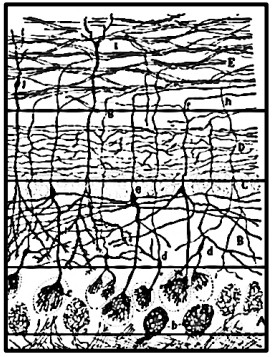
adjustments to the individual connectome. In this way, the connectome contributes to the definition of the Self.

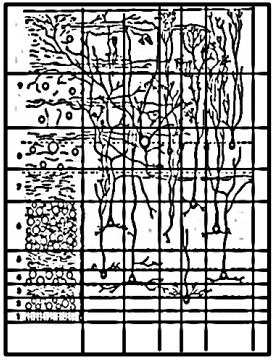
All neuron layers connect vertically with each other and horizontally with all domains in the brain. Also, some connects are made directly with different positions of the nerve system throughout the body.



Some detail images show the physical connections organized as a multidimensional matrix. The vertical columns and horizontal matrix lines come together in nodes that are specialized data processors. The whole volume of the brain is stuffed with this bio-matrices with specific tasks, and each command only can be executed in combination with one or more domains. Scientists try to simulate the operation of the brain but fear that no single computer or cloud network will ever be capable of reproducing this

brain processor, mainly because the interconnection between all matrices is dynamic, and that is the work of the MIND.



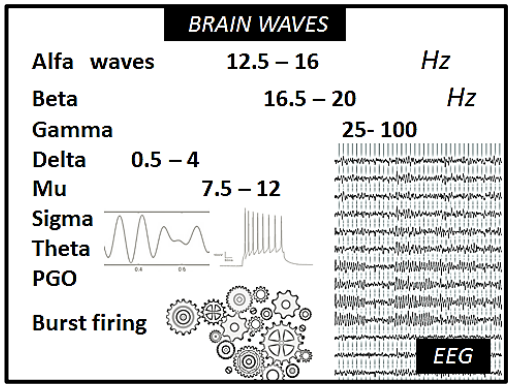


Out of: Brain structures and its origine. G.E.Schneider.

5.1 THE CHAOS PROCESSES IN THE BRAIN.

The brain and the nerve system form a super complex organization because of the quantities, the diversity of processing cells with dedicated programs, the flexibility of the dynamic connections, and the clustering of functions. Computer models managed to simulate only small features of brain activity. Probably the best approach is to compare the brain and nerve infrastructure with a manufacturing corporation

managing dedicated processes with computerized systems such as the procurement of goods and services, recruitment, remuneration and management of staff, production units, quality control, housekeeping customer service, planning, investment committee, board meeting, etc. A corporation is a continuous process of coupled systems having a specific dynamic and cyclic behavior. The activity of the brain can be measured indirectly by the electrical clouds produced repetitively by the mind. The cloud is an assembly of electromagnetic waves. Similar techniques like Big Data process are used to explain the information processing, .and regular performances are compared statistically to stress situations or trauma failures of the brain. That's what a doctor does when she/he takes an EEG at the hospital.



These are the main brainwaves; there exist many more. Not only the shape, duration, and intensity of the wave give information; also, the combinations are specific for mental states.

The registration and calibration of brainwaves is standard procedure in the study of the brain and the pathologies. The techniques used are magnetic resonance imaging (MRI), functional magnetic resonance imaging (fMRI), diffusion MRI, magneto-cephalography (MEG), electroencephalography (EEG), and positron emission tomography (PET), technologies that improve brain imaging drastically. [102]..

Despite intense efforts by neuro and computer scientists, the only progress is to discover the emergence of ever more patterns. Moreover, the correlation of the waves with mind expressions and the brain areas is generally weak. The motoric brain functions, including hart, breath, and other life functions, are better mapped. To relate all the brainwaves to a comprehensive system's model is a massive task for Big Data calculations. The brain processes seem to be coupled with chaos operations, which usually are a headache for researchers. Scientists search for synchrony waves coupled to brain areas in search of group natural frequencies. The brain processes are self-organizing, non-equilibrium transitions. Sometimes bifurcations happen as a migraine or epilepsy attack of a patient and bi-stable mental conditions.

Most fundamental studies in neuroscience, focus on the process of vision and its link to the motoric response. A specific and challenging issue is the management of contextual data. The focus at an object and the interpretation of what it represents are

strongly linked to the contextual surrounding. Similarly, the psychological mood and background play a role in what we observe. The translation of contextual issues into computer neuron language requires the processing of concurrent contextual inputs, dynamic grouping, dynamic linking, and dynamic routing to different neuron groups. In the real, the brain simultaneously scans and processes many more outer and inner functions. The mind hierarchy can overrule and prioritize activities. Intuitively, you can understand that rhythmic synchronization plays a fundamental role. Linked to prioritization, the biggest challenge for the neuroscientists is probably to understand the process of ATTENTION and CONSCIOUSNESS. What, for example, is the mental mechanism that selects what excites me at a given moment?

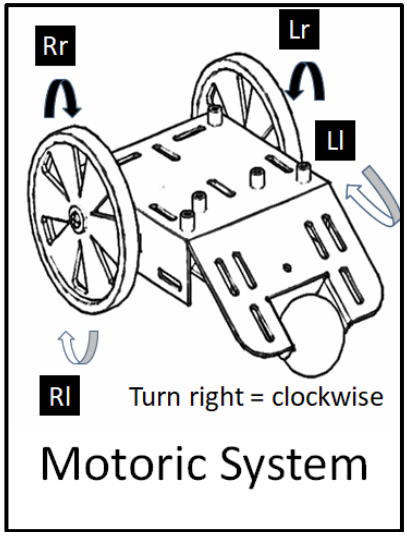
To initiate some knowledge of brain models, I draw a couple of simplified examples of how scientists approach the brain operation.

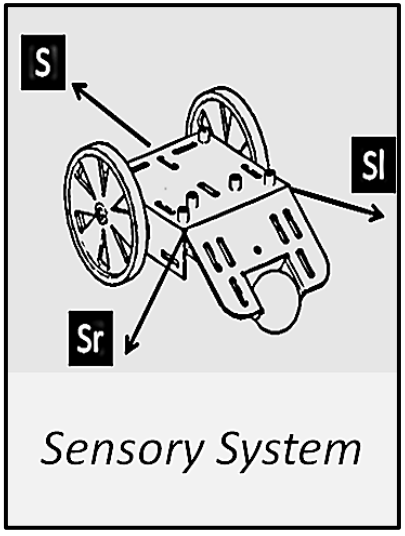
5.1 THE SENSOR MOTOR FUNCTION.

We have seen that the slime mold can adjust its shape to fulfill the biological needs for access to food and protection from the hostile surrounding. Scientists managed to simulate this behavior with mathematical algorithms used in analog computers. The

step to move into the surrounding while optimizing the functions is tremendously significant in Evolution. This ability initiated many bifurcations in body shapes, the sense organs, and mechanical solutions for the movement. Notably, the coordination of the different tasks to operate simultaneously is hard to solve.

Let's construct a simple robot as a primitive insect.





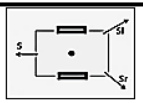
Rr: right wheel turns right.
Rl: right wheel turns left.
Lr: left wheel turns right.
LL: left wheel turns left.
S : sensor rear.
Sr: sensor front right
Sl: sensor front left.

We start with a simple configuration. The wheels do operate independently and can turn right or left or stands still. The system runs at a rhythmic pace of a clock rate, in which a set of parameters are active — the whole split into two sub-systems: the motoric and the sensory part. The motoric system consists of the two wheels; they turn in steps of 90 degrees clockwise (turn right) or anti clock as turn left. The system clock sets the rhythm, and we describe the model as a CNN construct. The sensory system has three sensors: one rear and two front sensors left and right under a specific angle. Let's call the robot C from Charlie or cockroach. C operates in an enclosed territory. The two sub-systems have a particular set of rules coupled via another rule protocol.

The motoric set comprises the right wheel Rr meaning that it turns 90 degrees clockwise, Rl is the opposite. Similarly for Lr and Ll. By combining the wheel turning, Charlie can stop, move forward, backward, turn right, turn left (at a specific angle). The turning pivots 90 degrees around the center point of C when R and L are operated. When only one wheel moves and the other is fixed, then the touching point of the wheel with the ground is the pivoting spot, and we assume that the robot turns than 45 degrees because of the friction.

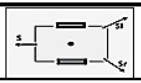
The sensor parameter is S for the rear and Sr and Sl for the front.

We extend the model with the environment parameter B, which means that a sensor touches a hostile point, which requires Charlie to react differently, for example, turn twice 90 degrees and double the speed. The following tables are a codification of the different motoric and sensory parameters and the actions associated with them in particular combinations.



R	L	movement C
0	0	stand still
+1	-1	drive forward
-1	+1	drive backward
+1	0	turn left 45*
-1	-1	turn right 90*
0	+1	turn right 45*
0	-1	turn left 90*
+1	+1	still, not stable

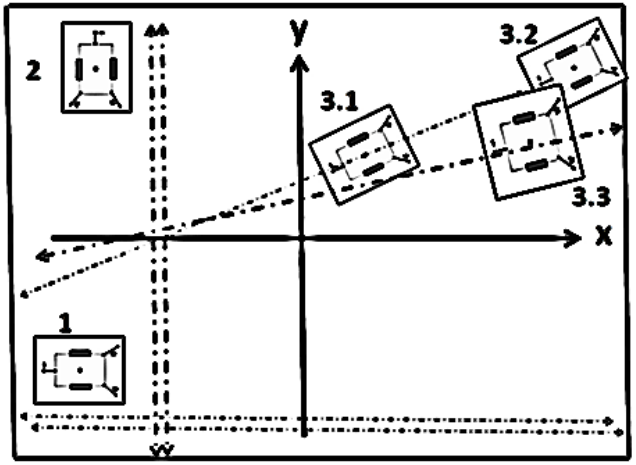
Rr = 1, Rl = -1, R=0 is stand still
Lr = 1, Ll = -1. L=0 is stand still.

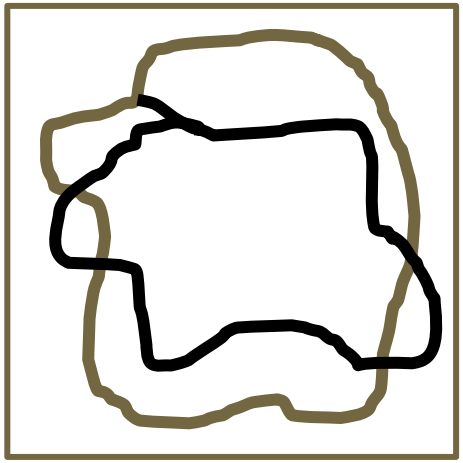


S	Sl	Sr	B	
1	0	0	ø	rear touch S → 0 C change direction.
0	1	0	0	C turn R45*
0	0	1	0	C turn L45*
0	1	1	0	C change direction
0	1	0	1	C turn R90*
0	0	1	1	C turn L90*
0	1	1	1	C change direction
0	0	0	ø	initial state start the motor.

B is the border 1= hostile
0 = friendly

It is not too difficult to imagine and draw the trajectories of Charlie starting from some beginning position like in the next drawing.



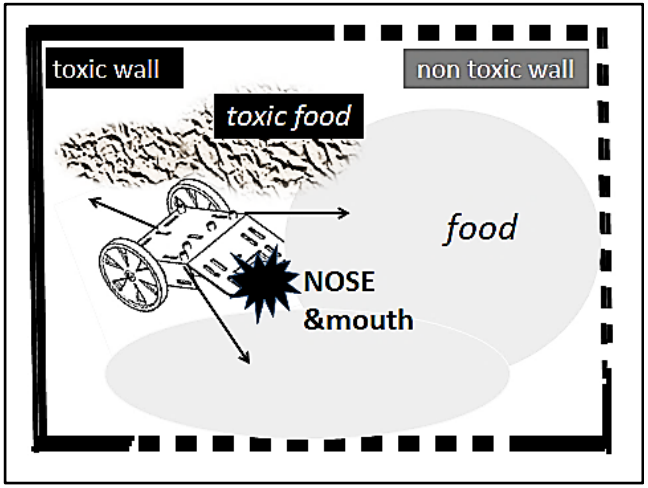


.

Starting point 1: C is positioned parallel to the x-axis. It is clear that Charlie, once started, runs up and down in straight lines. We assume that the front sensors touch the border simultaneously. Similarly, in 2 is the running parallel to the y-axis. In example 3, is the starting position under an angle that means that one front sensor will touch first, then disables the other sensor as long as it feels the edge and turns

45 degrees and reverse (3.2). When the rear sensor reaches the opposite site, C reverses direction. When you map the center point of Charlie, you will see that the points follow a regular pattern which depends on the starting position. In reality, it is a chaotic pattern because the sensors are not ideal, they bent a bit, or the reaction is delayed, or a wheel slips and the turning angle is not precisely 45 degrees.

Now we take another more complicated situation.



Now I put the robot in an enclosure which is fenced off with partially electrified wire. For Charlie to touch the wire is painful, and he will accelerate when feeling that area to get away from it. Into the field, where there are patches with lovely food, but also toxic vegetation to be avoided. Now I give the robot a nose to sniff and a mouth to eat. Charlie only eats when his stomach is empty, and when he finds the right food.

This means that we have to add new functions and parameters to the system. The nose N can sniff in three directions: in front (1), right (2), left (3). The food is F, and F0 means there is no food at the spot, F1 is OK, and F2 is toxic. X, Y are the coordinates of the position of the center point C of the robot, and θ is the angle, P = 1 when the power is on and is zero when off; P = 2 when Charlie flights from the electric wire with increased power. We reserve W as an additional parameter, and many more can be added. As mentioned before the system operates in steps. A set of parameters defines the status of the system and varies at each sequential step of the system clock. Now we can present the model in matrix form like in the next CNN chart.

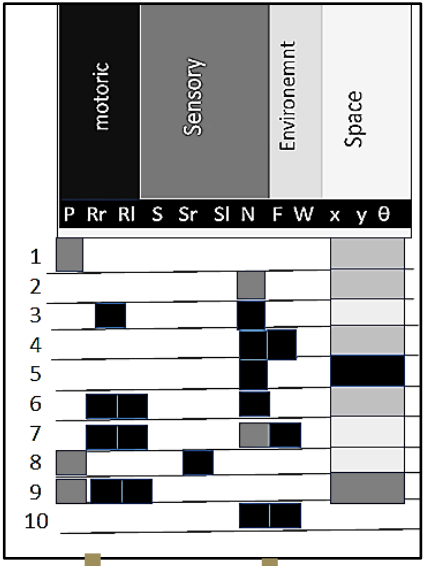
P	Rr	Rl	S	Sr	Sl	N	F	W	x	y	θ
0	0	0	0	0	0	0	0	0	X1	Y1	θ1
1	0	0	0	0	0	1	0	0	X1	Y1	θ1
1	+1	-1	0	0	0	1	0	0	X2	Y2	θ1
1	0	0	0	0	0	1	1	0	X3	Y3	θ1
1	0	0	0	0	0	2	0	0	X3	Y3	θ1
1	+1	+1	0	0	0	2	1	0	X3	Y3	θ2
1	+1	-1	0	0	0	-1	1	0	X4	Y4	θ2
1	0	0	0	1	0	0	0	0	X5	Y5	θ2
1	-1	-1	0	0	0	0	0	0	X5	Y5	θ3
1	0	0	0	0	0	1	1	0	X6	Y6	θ3

1 Starting position. Power off.
2 Power on. Nose start sensing ahead. No food.
3 Robot moves forwards. *Repeat till food found.*
4 Stop. Eat till no more food.
5 Sniffs to the right. No food.

6 Turn right 90 degrees. Sniffs in front.
7 Robot moves ahead. *Repeat till food found.*
8 Right sensor reaches the wall.
9 Robot turns left 45 degrees.
10 Stops as it finds here food.

When you compile all the above CNN states, you get a large matrix. When you color the cells black, white, and grey for graduations, you discover patterns, as I have discussed in the earlier chapters. All CNN systems need a rhythmic clock to proceed in time and a control unit that stores and adjust the rules during processing. We call the whole the brain of the system. It is interesting to map the relationships between motoric, sensory, environment, and geographical space. Most models can be conceptualized as combinatorial logic like all computer algorithms are.

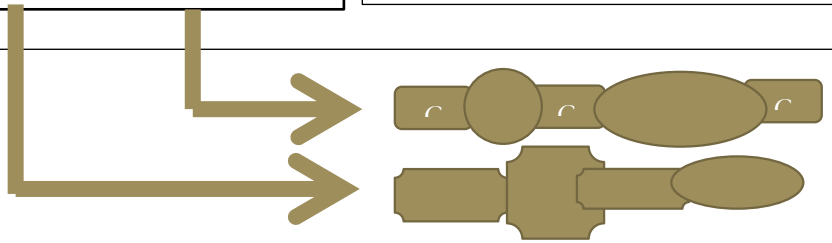
In the next illustration, I present Charlie in the most simplified version of the biological functioning of the brain and body. The extension to humans is similar, resulting in a super complex system with rhythm and pattern processing in chaos mode. In such a super system, there is cooperation between sub-systems; there is balancing with attractors and repulsors. Scientists have detailed the model of Charlie for the human eye and hand coordination. The eyes adjust during the process to the position and movement from the hands to grab an object. Eye-hand coordination is, for us, the most common daily operation, but in scientific terms, it is a very complicated exercise, even without contextual factors. Paul M. Churchland developed a simplified version in his publication:]Some Reductive Strategies in Cognitive Neurobiology'.[3]. The CNN type patterns which translate the relations between the sensory and the motoric activities are projected into state spaces.



Data types that are active during the system evolution. The greyscales indicate the intensity of action and participation.
Space and time are always participating as the element of the core consciousness.

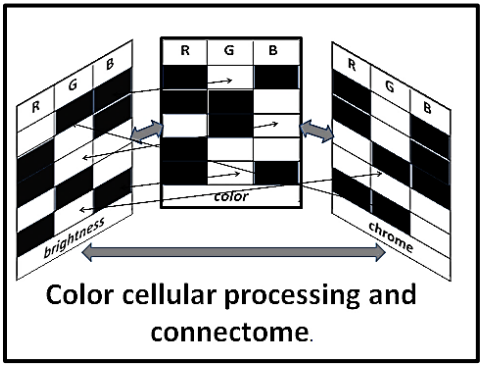
This chart can suggest the resemblance with the specialized Broca areas and the interconnections and the brainwaves when there is activity.





Brain waves

The Charlie model is a very rough illustration of the principles of brain operation using CNN engines. The brain processes continuously n-dimensional matrixes for all the bio-neurological activities. Processing means the edition of maps to relates to other plans in search of correlations between the matrix rows and columns. New patterns that emerge from the calculations are stored in another chart or projected on a new sheet.



Color cellular processing and connectome.

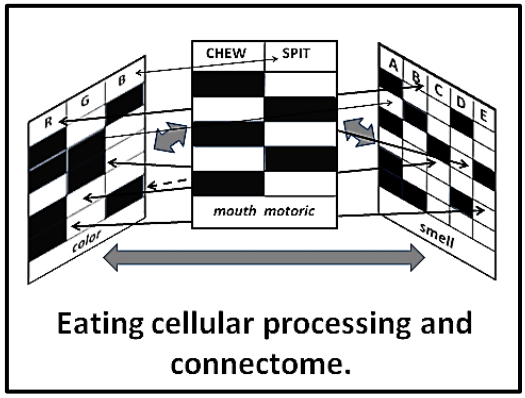
Take the example of the processing of the eye's incoming data.. We know that in the retina, three types of cones detect the basis colors red, green, blue, from which any other color can be synthesized as a weighted combination. We also know that the eye needs a defined time to take the picture, that's why we do not see the flickering from the 50 Hz writing lines on a television screen. The eye takes 10-20 msec to process a picture fragment. The hypothesis is that the CNN view process, which translates a picture into a mental code, is around 20 msec. (there is no scientific reference for this). More elements that make our view are color balance xR, yG, zB content, brightness, chroma, are detected by dedicated cells. Together, these components

create the mental color appreciation in a given context. Color, brightness and chrome matrixes combine in a 3-dimensional CNN map illustrated.

The advantage of CNN processing of parallel maps is that at every step, the correlations with the corresponding stage of the other plans can be made, and new rules defined for the next step. The many specialized neurons with rhythmic and conditional firing and the massive amount of interconnections point to a CNN concept with cross-links that activate at a specific step in the sequence, creating tremendous flexibility. CNN pattern generators follow the rules being stored in specific maps; these rules are encoded in the DNA, which is a particular CNN map. The DNA is a very long sentence because it writes all the rules for all the CNN sheets and the connections. The system does not need ample memory storage because everything is registered in the DNA, the connectome, and the specialized neurons.

The sense-motoric coupling is of the most significant importance for the species adaptability to the environment. Understandingly, the neurons have specialized as dedicated processors. There are hundreds to even thousands of such neurons, and each neuron is an assembly of self arranging molecules — [102 p70]. The networking of specific neurons is a new topic of research. Some act and connect as lone neurons, others form groups, and the dynamics of the assembly creates the specific function.

We can draft a similar concept for smell and motion and taste. Let's build a simplified infrastructure of taste receptors in the mouth, and having the highest concentration on the tongue. The taste buds sense five basic tastes: sweet, sour, bitter, salty, and umami. As with the primary colors, we synthesize all flavors with these parameters and map them in an initial CNN matrix. We add more independent elements that determine our appetite like texture, color, smell, temperature, etc. Your first bite starts a chaos protocol to map the attractors and repulsors and put the corresponding phase space (matrix) in the priority queue for processing. Take, e.g., smell, temperature, and color (in case the food does not conform to the standard). The five taste components can be prioritized to your individual preferences, and to the actual needs from the nutrition system, e.g., to supply sugar. It is not difficult to conceive a computer program that makes the transformations, projections, and statistical calculations until all the maps reach a stable image or pattern. At this point, the brain triggers the motoric system, and you start chewing.



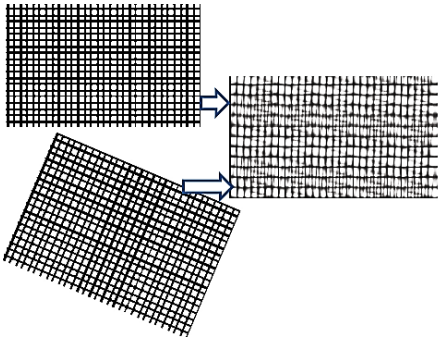
Eating cellular processing and connectome.

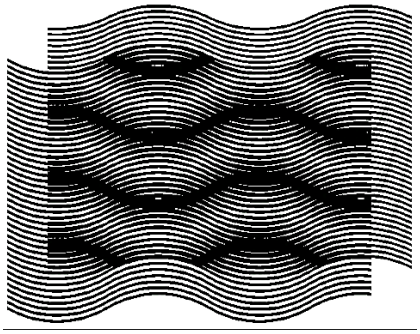
The sensory process repeats, or you spew out the bite. Again this is a very simplified example to demonstrate the massive complexity of the brain as a super system.

Above map is a connectome of 3 maps involved in eating: the color and the taste is sensory CNN maps, and the motoric map decides to start the chewing or to spit the food out. There is a map to map connectomes and inter-cell direct connections.

The detection of colors and tastes demonstrate the sensory and the motoric space combined with the feeling domain, which leads us towards the content of the MIND. The very simplified examples make clear the enormous complexity and connectome of the human brain in its size and volume. To illustrate the complexity: the vision function of a monkey needs more than 30 underlying maps [25]. There are maps of the mapping of other plan-levels with CNN content. Moreover, the connectivity of the connectome is not fixed and adapts over time. All CNN map operations, calculations, and projections are autopilot functions belonging to the unconscious biological life.

Another illustration of overlapping datasheet operations is the Moiré figures. Lay two regular unrelated patterns on each other, and you can see total different pictures.





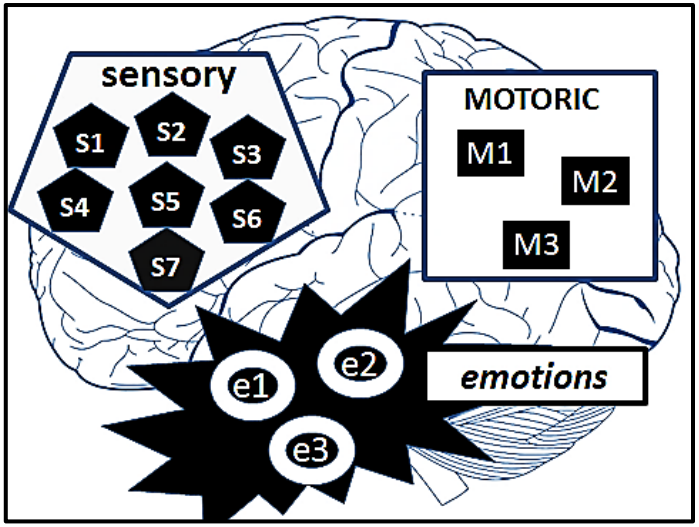
The dynamics of the sheet processing have a specific rhythm per function and synchronize together. According to William Klemm [114], the frequency of synchronous activity seems to change over time with maturation.

How exactly the processing of the patterns happen is not yet clear, One model is from Gerald Edelman [113] and is called the Theory of neural group selection or TNGS. I try to summarise in a few infographics maps on how the algorithms work, with the food tasting procedure.

Three areas in the brain work together on the tasting: the sensory with two categories, the primary tastes, and the temperature of the food. We only retain in the model too

hot and too cold. The second area involved is emotional. For example, I like to experience a new dish, but I fear food poisoning. The third active domain is the motoric functions of my tongue, the chewing, and spitting in case I suspect danger. The three brain areas that participate in the action are formed by temporary cooperations of general and specialized neurons.

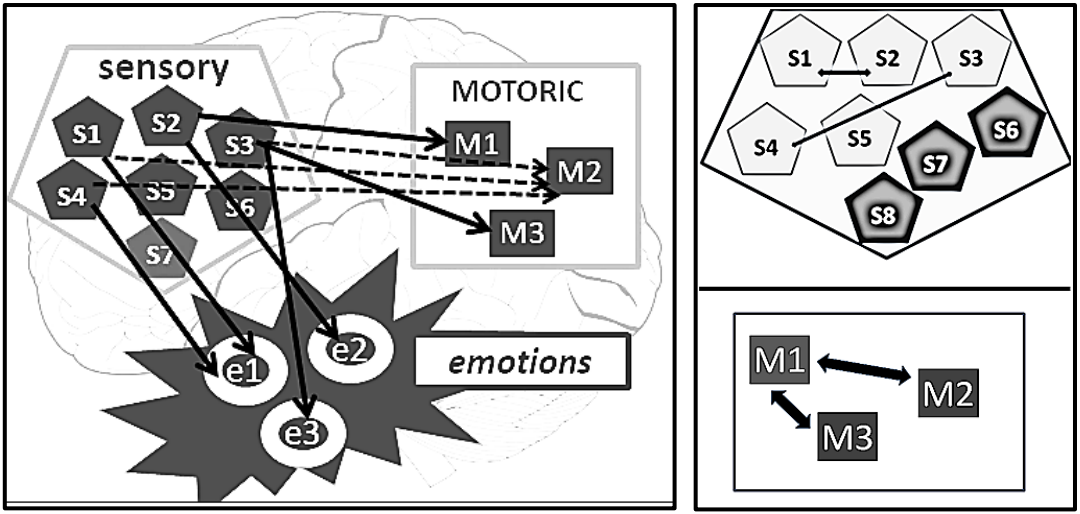
Now we translate the brain states in relational maps and define the links. In the real, the links are dendrites belonging to the brain and nerve connectome. Some neurons are specialized in onde directional communication, others in two ways. Some connections participate in the active domains, and others have an alert function belonging to another field map. The connectome is an evolutionary construct resulting in sweet and sour's charm, and that bitter and sour signal problem and alerts the motoric to spit the food out. In the motoric function, the tongue is involved in the chewing and the spitting; this is the way the tasting connectome is built.



S1 Taste sour. S2 Taste sweet
S3 Taste bitter. S4 Taste salty
S5 Taste unami.
S6 Temperature too HOT
S7-.8 Temp. OK, too COLD

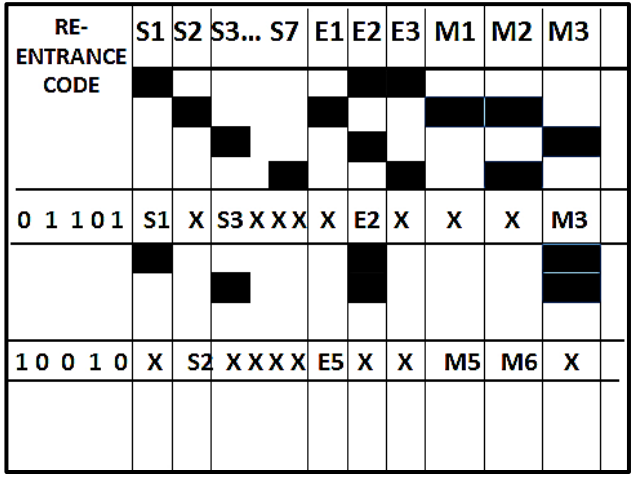
M1 Motoric tongue twist
M2 Motoric chew
M3 Motoric spit

E1 Emotion seeking (explore)
E2 Emotion care (desire).
E3 Emotion fear.(toxic).



We translate now the sensory, the motor, and the emotional maps in three CNN matrix. The brain selects and activates the domains first and start a synchronizing process to establish communication between the three sheets. This initiation begins in the hippocampus. The process first awakes the older available maps of food tasting and prepare for comparison. Now tasting proceeds in discrete steps till a stable image is obtained in the S matrix. The past experience is mainly emotional memory. The S matrix is projected on the E matrix like a Moiré image. The processors of M, S, and E

search at a synchronized rhythm for correlation between them. Gerald Edelman adds here the notion of *re-entrance*, which is a principle allowing to change the rules at any CNN step, changing the connection pattern and data routing. The re-entrance also selects new brain centra to participate, which makes the brain an extremely flexible self-learning machine. The learning and memorization are realized by the chemical data processes that, after many repetitions, stabilize in the making of other molecules and new connections that make a skill permanent.



This CNN map starts with an index code, referring to the next activity processed, e.g., look for correlations, compare with the previous sheet to see if the movement is aligned to the sensory, or to relate to an old map from the past.

Although CNN processors help a lot to model the functioning of the brain, it is not sufficient. Self-learning is a chaos process that reaches an equilibrium that needs memorization and prioritization. The connectome takes part in the memory, but also other functions become specific task processors as specialized neurons and neuron configurations. CNN is not the only mode of operation; many hardware and software algorithms are unknown. Examples of specific cells are the 'place cells.'[102 -p100]. This kind of neurons was discovered in rat experiments — the neurons fire at a specific rate when the rat enters a known enclosure. Grid cells are organized in a small number of maps with discrete properties. In the group of the grid cells, there is a category called border cells, which can be labeled as dangerous. Also, the positions of the rat's head are dedicated to groups of cells, which makes the data processing more effective [102 -p113]. These discoveries push the models of the brain to look like a society run by specific participants in collaboration and in synchronization.

The specialization is wired on all levels like receptor cells, neurons for the senses to detect chemicals, light, pressure and stretch for the skin cells, vibration, electrical and heath gradients, radiation, and magnetic fields. [8]. Some neurons specialize in the generation of clock frequencies that coordinate the synchronization between the sub-processes of all the brain atlas domains. They are the generators of rhythm, and a specific group makes our biological clock of cells.

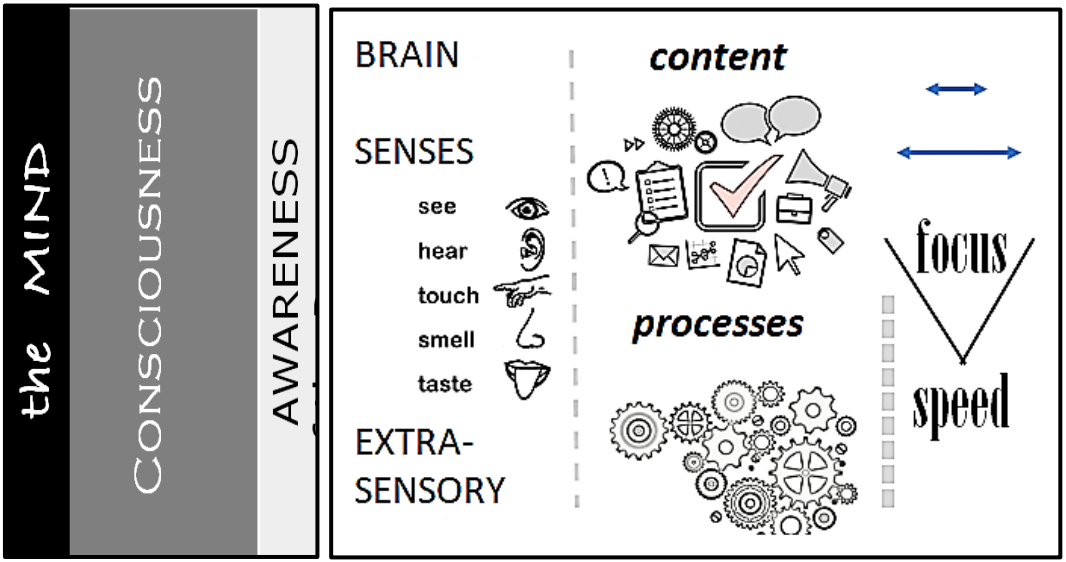
Cells and cell groups have been discovered that react on specific images or part of pictures like circles, parallel lines, or complete sceneries viewed in the past — [106 - p188]. According to Wilder Penfield, all scenarios from the past are stored in micro-circuitry in the cortex.

6 THE MIND.

6.1 FROM CELLULAR NEURAL NETWORK TO CONSCIOUSNESS.

We differentiate the MIND from the technical operation of the
brain. The mind is the conscious experience of the functioning of the individual brain and senses. [Stanley Sobottka]. The mind has content and a field that depends on the focus and dynamics. The content of the mind consists of thoughts, emotions, feelings, dreams, vision, and a unique conglomerate called the 'I.'
The brain, the nerve system, and the senses participate in a dynamic chaos process together with a new concept called the extra-sensory. The senses trigger most operations, but something also starts the mysterious extra-sensory. The body and organ motoric engine communicate in chemical-electrical coding, and we are not aware of what's going on inside us. The inner chaos processes run smoothly until they hit an 'out of equilibrium' state like when a disease, hunger, or fear pops up. The neurons fire patterns resulting in awareness as an internal affair. Those signs can appear in consciousness. Probably, the brain focusses primarily on the input of the senses from

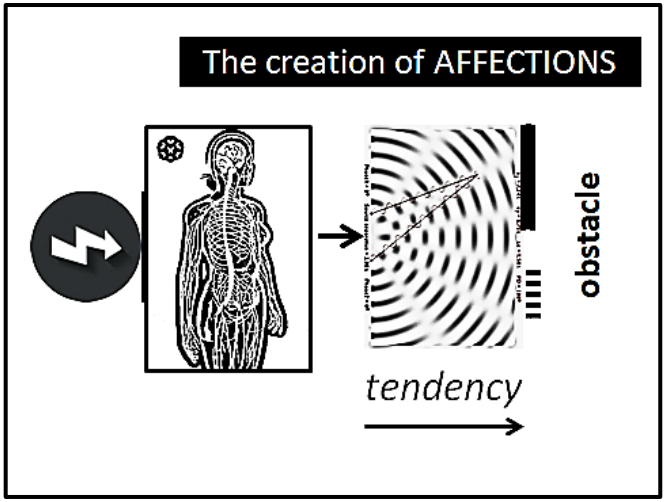
the external, and leaves the internal processes to the autopilot machinery. When we drive a car, we focus mainly on the surrounding until some alarm light flashes.

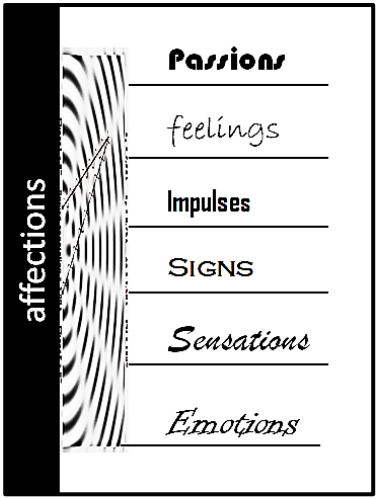


As explained earlier, the body is a balanced assembly of organs whose activities are managed by the brain and the nervous system, which brings back to the brain the sensory inputs. Clouds of information and instruction waves are transported through

the nerves and radiated as electromagnetic waves. We classify these data waves as sensory, motoric, and extra-sensory, to which we add the emotional feelings. The mind waves do not resonate only under the skull but vibrate through the whole body. According to some people, radiation also goes beyond the body. The psychological, emotional, and feeling can be modeled as a chaos system with inputs, outputs, and boundary restrictions. Psychologists apply many concepts to explain the domain of human feelings, actions, and behavior. The infographic map below reflects the view of F.Paulhan in his book 'Laws of Feeling. '[ ]. I use the theory on Complex Systems to visualize some operations of the Mind.

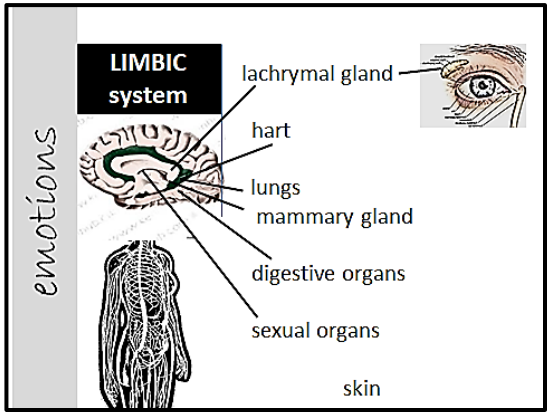
Consider the mind as a system activated by the senses or thoughts. The system responds with the release of a spectrum of signals or waves. Such a wave is called a Tendency. The word indicates that the response propagates until it fades altogether. When prefixed ideas of memorized experiences obstruct the tendency, new waves appear. Usually, there are more hindrances for the tendency wave. Interference can amplify or smoothen each other. The interferences are called Affections. A sub-wave has its characteristics of frequency and amplitude, which translates as a personal psychological manifestation. The psyche is a spectrum composed of many emotions like passions, feelings, impulses, sensations, etc.





The link of brain sections with psychological behavior is well documented in what is called the Limbic system, which contains the brain parts: septum, hippocampus, entorhinal cortex, amygdala, cingulate cortex, hypothalamus, and some more specific area's. Malfunctioning of the limbic system is the so-called psychosomatic diseases. The coupling of the limbic and nerve system to the organs works in both directions. The Buddhists, the yogi, and theophany make the relation explicit between the mental and the psychological states with the body organs.

When we talk about the MIND, we open a vast field which extends from the neuron configurations, to wave functions and even to the holistic society. Emotions and Thought drive Cognition. The next map serves as an example of the view from a holistic approach.



We can look into the mirror of the soul from many angels. I try to link as much the brain infrastructure, and its processes to the mental manifestations of the mind.



Theosophy is a holistic thought which is close to the ideas of Buddhism. The chakra represents the body parts and organs against mental functions and states. There are many versions of chakra, such as foot reflexology. Some scholars go even further and extend the body to an aura or a pattern of radiation of energy waves outside the body,

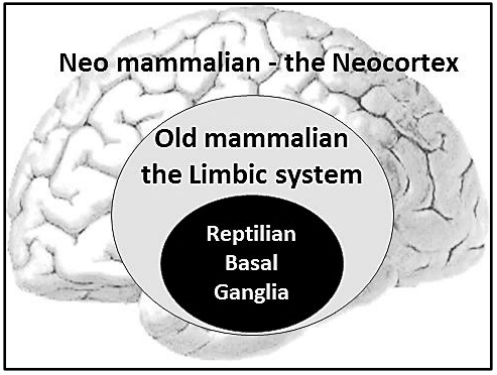
which is so far speculative. Although the neuro-sciences carry the name Science, many ideas are hypothetical, mainly when the Emotions and Thoughts are discussed. Best is still to follow the rational in the vast landscape of the Mind, where even professionals get lost in phantasy.

How to couple Psychology with the brain-nerve-neuron infrastructure and the waves it creates? The neuroscientists have allocated many emotions and mental states into brain geography. Again, no single emotional feeling occurs in one particular area. There are always different regions active in a flexible configuration, which means that any specific sense of, e.g., anger does not always provide the same wave pattern. For each person, it can be different.

The whole issue of the MIND is the notion of CONSCIOUSNESS. The scientists come close to a physical description of Consciousness. The first step in the understanding of Consciousness is EMOTIONS. A comprehensive explanation on this topic comes from Jaak Panksepp 'The Foundations of Human and Animal Emotions 1998'. 1110].
Emotions start with SENSING. A total model of Sensing describes how humans interact with the environment and within their own body-mind entity. There are three categories of sensing: external (vision, smell, hear, touch), internal (hunger, oxygen in the blood, hormonal housekeeping, etc.) and the AFFECT sensory system with the seven psychological terms:

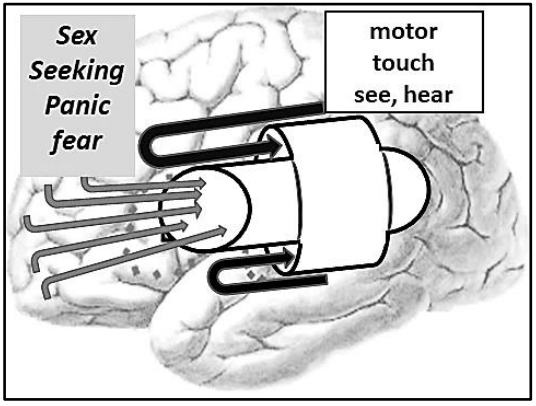
Seeking (exploration, anticipation, desire, enthusiasm, curiosity)
Fear (flight or freeze to avoid physical destruction and pain).
Rage (frustration, resentment, retaliation, jealousy, envy).
Lust (sex drive, urge to reproduce).
Care (desire to nurture).
Panic (anxiety when separated).
Play (rough-and-tumble play, fun).

The BRAIN organ mirrors the Evolution physically in the network of neurons, the connectome, the cell DNA, and the semiotic code, which regulates the system communication. The MIND is the continuous rehearsal of the story of Evolution and the personal physical and mental experience updated until now. This theatre plays in a rhythmic process where all past events determine the subsequent psychological pattern formation. The first molecules from the universe participate in the life of today together with the complex biological molecules that emerged later, and the pattern formation of organs and the nervous system. The first life species still participate in daily life. The brain is the organ that physically integrates the steps in the Evolution of the life mechanism, which is called the Maclean triune brain concept.



The reptilian core provides the automatic reactions of food-seeking, aggression, etc. The Limbic system adds psychological and emotional social resolution/
The neocortex covers organization, logic, mediation, and all cognitive functions.

Deep in the brain, there is an area where connections from the emotional field come together with the motoric and sensory nerves. This facilitates cross-talk, and the sensory can trigger the emotional, which influences the motoric; think of the body language.



Here follows what Damasio Antonio summarizes: we can say that there is an old brain core handling the necessary biological regulations down in the basement. Above in the neocortex, the deliberation is done with subtlety and wisdom. Upstairs in the cortex, there is reason and willpower, and in the downstairs cortex, we find the emotions and flesh sensations — [110 –p147].

There are several layers of consciousness. The first level is in the model from the slime mold, with physically embedded functions. This view is contrary to most philosophers who regard consciousness as something holistic. In the rational model, we fit the Emotions and Affects as the update of the brain state of affairs. We can compare these states as the chaotic dynamics of the brain waves which steer the physical and the psychics of Body and Mind.

More in detail, the communication or the semiotics from the brain waves is coded in emotions and affects by connectivity, chemistry, electromagnetic waves all modulated in intensity, frequency, and composition. The neurologists managed to map lots of the physical relations between the brain-nerve system and the motoric, the sensory, and the emotional. The chemical blueprints confirm that the relations between the brain activities and the mental states have many interferences. As a result, all psychopathic drugs always create side effects in emotional and motoric behavior because these

medicines intrude on several brain geographies. When you are drunk or under the narcotic influence, the motoric, and the emotional loose coordination and stability. A positive example is the beneficial effects of rhythm and synchronization in daily activities as an essential part of the mental health and emotions; that's why music as an audible, rhythmic sensation is so dominant in the conditioning of our feelings.

I wrote already about the specialized neuron rhythm generator from which the main one is the daily clock. A group of neurons called the suprachiasmatic nuclei, are located behind the eye and above the optic chiasm [19]. That's why an excellent way to overcome jetlag is the exposure to bright light in the morning. These specific neurons fire for more than 24 hours even after disconnection with the rest of the brain, a fact that shows that the beat generators of the brain are a crucial mechanism. The understanding of the rhythmic behavior and the dynamics of the brain processes seems for the neurosciences hopeless complicated. The whole conscious and cognition builds on the inner rhythm processes like the learning of language. Cognition relies on the fundamental rule of the transcendence triplet – ground, signifier, signified.



The biological SELF is a cumulative heritage of half of DNA transfer in the offspring steps, and half of the adaptations to the physical and social environment in the course of Evolution.
The SELF is the reverse Fourier of all life forms and experiences which an individual holds in its life span.

6.2 SCIENCE, PHILOSOPHY, AND THE CONSCIOUS

What is consciousness?'

There is no single clear answer to this question, and any view contains elements from the sciences, philosophy, and some people call upon religions at this point. I try to compile the components that take part in consciousness. Saying so, insinuates that the conscious is an activity, in which also language takes part. To fully answer the question needs thinking, and thinking only can be a relational affair. We can dream up an answer

or snatch an intuition; to formulate what consciousness is, needs rational language based on thinking.

To postulate that the brain's activity is a sequence of relational mental sheet manipulation is to claim that consciousness is activated at any moment when we establish a relationship — connecting means that you link with something split. So, in this concept of consciousness, there is a sequence and a relation, which implies that sequence is before relating. We extend this philosophical thought to the idea that time, implicit to sequence, is before space (the split relationship). Conscious becomes now the coincidence or co-existence of time and space, which I have earlier defined as a SIGN. Remember how a signifier becomes (is followed by) signified, which is called a SIGN when meaning is attached to it. Remind that the traffic stop post does only impose its authority of a Sign when it is planted at the road crossing and at the moment when I arrive at that spot. A sign merges space and time in a moment of NOW. A sign is realized when a signifier points to something that obtains a signification. Awareness is the signifier, and the signified is an image as the result of consciousness. Finally, we must conclude that consciousness is a happening NOW moment.

The translation from one map into another happens mostly unconsciously. When we are aware of a transformation means that we are conscious of something happening, or we

become conscious of a Relation. When maps connect in a series, we call it a THOUGHT. The relational CNN maps refresh or change at a rhythmic space, which is the source of the feeling of Duration.

The relational cycle is known as the logical steps zero, number, the next, or 'signifier' becoming a 'signified sign'., or source, signifier, sign. A chain of these rhythmic steps of thought is called Transcendence. The transcendent thoughts become the generation of meaning, which is the path of cognition building. This concept seems entirely consistent; the only thing left is to explain how something undefined can act as a signifier to point at another thing becoming a signified Sign. The term Signifier is now the same as AWARENESS.

AWARENESS, as a step to conscious, is also hard to explain. Psychologists use the technical term of Sentience or the capacity to feel, to experience, to perceive changes, and to choose alternatives. To distinguish options, and to select out of them, brings us to another idea: which are the selected brain maps for comparison or projection? Part of the answer is that DNA prewires the brain as a result of evolution and learning, but there are still options left, and the question remains: which mechanism makes a choice?

Technically, AWARENESS can only come after that something happened. You can speculate that an event might occur, but to become conscious of something, it must have happened first. So, all emotions, feelings, and thoughts have popped up before I am aware of them. I am only conscious of some of my auto-pilot actions. Association of consciousness with the happening of life results that I only can live in the past. Here stop all discussions on FREE WILL. It was decided for you … by what or who? The only answer is IT, the life engine, or as Friedrich Nietzsche calls it the Will to Power.

Can we conceive a non-cognitive concept where there is no before or after or elsewhere? This idea is called the CORE CONSCIOUSNESS, which only operates in now and here; or better in no space and no time. Dreams belong to the domain of the core-conscious. Dreams happen in a non-logical structure where space and time are merely random appearances without flow. We use Space and Time in intellectual or cognitive concepts, and they are pure fiction derived from feelings. Space and Time are signs that we manipulated in mathematics, and turn out to be very useful in building new ideas. Cognition is a series of steps uplifting meaning to the next level. The rhythm or the beat of the core consciousness is the motor of the extended or broad consciousness. Core-consciousness holds the imprint of the functioning of the whole body and rhythmically stimulates the execution of the biological and mental tasks. Similar to the slime mold's system to adapt its shape to the opportunities and dangers of the surrounding, so does

the core consciousness represents all functionalities to realize a specific species. We can compare the core consciousness as the bootstrap program that initiates a sophisticated software program. The core conscious does not possess a longterm memory nor DNA, which are required for the extended consciousness. Neurologic patients who have their higher brain functions damaged still rely on the vital biological services provided by the core nucleus.

We can say that conscious is powerfull when the biological machinery is performing, and the relational capacity of thought is strong, but we cannot measure it or quantify. We both can be conscious of something, but the content is different. We are conscious about feelings and emotions, but not of memories and images stored in the brain. Is consciousness a product of evolution, and is it beneficial? It is not a summit but rather an intermediate state. It is the bottom line, a communication gate from human to human. [203 –p13].

Last, the medical definition is: consciousness is when normal wakefulness attention and purposeful behavior are present.

Whenever there is consciousness, there is some element of recollection. It recalls an earlier phase from dim recesses from the unconscious.

[319] Alfred North Whitehead. Process and Reality 1928]

Consciousness is understood as a microscopic neural ordered switching of patterns which result from the microscopic interaction of elements from the brain.

Consciousness is a state in which several sensory stimuli and mental functions are integrated in a few seconds and standing in the focus of one's attention.

[402]. Klaus Mainzer. A little book of Time.

6.3 FROM THE CONSCIOUS TO REALITY AND COGNITION.

Now we make a move from consciousness to REALITY.

Consciousness pops up at the interface of one CNN map projection to another sheet. The differences between maps create a sensation. As the map switching is rhythmic,

we feel a duration (remember the relation between frequency and time). It is that feeling of rhythm which creates Reality.

Now we have to climb some more philosophical stones. A difference reveals itself only when there is a distinction, which means that it is not all the same; some things are different, or there is a limitation or a split. A transcendence of a limitation is a SHAPE, and a transcendence of a Shape is LIKELINESS. Recognition relates to likeness, and the next transcendental steps creat meaning, ending in cognition. This is the way by which we create Reality.

There are many distinguished objects in the neural sheets, which only exist in relation to another thing, or the same, but in a different position. The position is relational. When we sense an object as a visual percept, we, as a cognitive convention, put the object in a 3-dimensional map x, y, z. Now we switch to physics' domain of CHANGE, or in neural terms: a series of maps. Change is the most common phenomenon in the real world. We cannot escape change because of the fundamental rhythm of life, making change a given. As we transcendent the sensation of space and time into sign language (X, Y, Z), and the subsequent neural map also carry the codes X, Y, Z but shifted in time (the duration of comparison of the sheets), Reality has two sequent 3-dimensional maps or six dimensions, [32-p152].

> “ If we think in relations, and if relations have some universal form, it is manifest that such universal forms of relations become universal forms of consciousness”.
>
> Herbert Spencer. [320 –p172].

Now we combine the statement that 'Life is definable as the continuous adjustment of internal relations to external relations.' [320 -p96]; means that we should broaden the initial steps of cognition to the exchange of information, in general terms, to Semiotics. Before we handle the language of the conscious' communication, we need to understand the technical processes of perception.

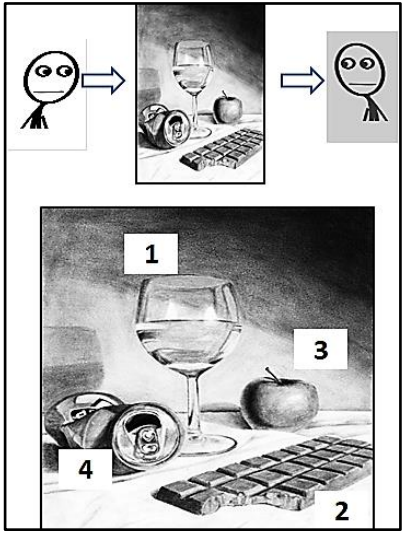
PERCEPTION is the entrance to the Mind, which passes partially through the conscious but also via the unconscious. Perception is interactive and is not a one-way direction. Perception is as much acting on the environment as it is on receiving signals from it. [112 -p243]. This is a fundamental principle meaning that we very much integrate with the environment, and we have no idea how far or how deep the involvement of the surrounding goes, and who participates, and in which way. All systems are coupled synchronously. When I touch an object with my fingers, there is a set of information about the object (shape, roughness, hardness) traveling to the brain. At the same time,

the brain holds a map of the position of my arms, hands, fingers, head, eyes, and all muscles and joints that participate. Internally, the data of my experience is compared with previous similar experiences and the mental maps of valuation or emotions. Now, the brain prepares new motoric actions.

Perception is the most active VISUAL sense for humans. Together with the hands, vision takes 70% of the energy of the brain's processing. Vision, human's best developed sensory system, creates together with the motoric machinery a crucial tool to operate in the environment. The processing of the visual is the best-studied topic in neuroscience. Also, the coding and handling of the data have progressed considerably. The main principle is that we detect PATTERNS that correspond with preassembled or dynamic assembling cell configurations, called an inner mental state. The processing is conditioned by the VISUAL CONTEXT of the surroundings and the ongoing activities. Perception looks for stable patterns called dynamic grouping. Bi-stable images are a first study object to explain the mental chaos mechanism of vision.[17]

6.4 THE VISUAL AND THE MIND.

How to link the model of brain maps of vision to the everyday psychological experience? We first analyze the process of perception.

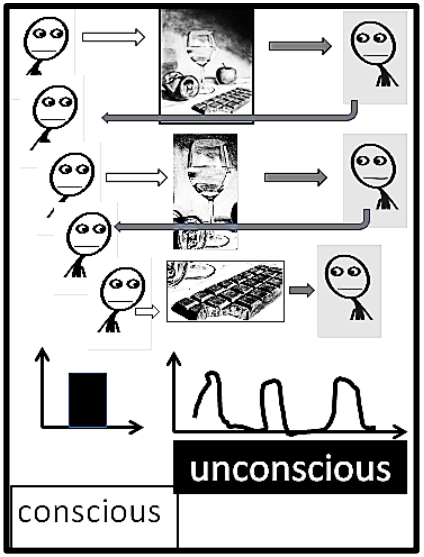


To perceive the World is to co-perceive oneself."

When I look at a scene, I first see the whole, and then I differentiate. What is in the picture checks with my unconscious the relevance of what I see. When I am thirsty, the glass of water tells me to remind me that I have to give priority to drink. Then a next priority will be processed and stored in the unconscious. Walking along with a shop, I am reminded to first look for drinks and next for sweets.

The process is chaotic where iterative selection and comparison of cellular maps search for a stable point, which releases a meaning to the conscious. In this way, we can speculate that the unconscious operates pulsive in the frequency domain (brain waves). The reverse Fourier integral is a signal or sign in a time laps colled a moment or NOW.

Consciousness is jumping from Now to Now, in which time and space coincide into a Sign with a Meaning.



Here follows what happens. The viewer differentiates (ask for details) and integrates the inputs (tries to make sense of the data). This goes on until a stable mental map of the view is reached, called an IMAGE. In some cases, people do not manage to re-integrate the parts of the picture and can make no sense of a whole. The person will focus on a specific section or element and get obsessed with what we call *paranoia*.

Sometimes, an emotional image map is dominant, and no stable meaning can be formed, which can result in mental, or psychological deficiencies.
This kind of mental images and thoughts or emotions pop up all the time, what the waves in a brain-scan testify. Obstacles and boundaries to waves create standing waves or interferences. Seeing an object might trigger an insatiable demand for a specific object; now, we speak of a *fetish*. Some woman tends to buy shoes anytime they approach a shoe shop. By satisfying that need, they hide a real suppressed DESIRE. In extreme cases, this desire is called NEUROTIC behavior. The opposite does also exist. The needed object is at reach, which usually triggers the action to obtain the target. The contrary happens by rejecting the needed item; the desire is insatiable. Anorexia is such a case: the food is there, and the patient refuses to consume it...only to demonstrate her or his passion.
Neurologists found that the mental images stored in the unconsciousness occupy the frequency bandwidth where the green color is situated. In this way, to appeal to the unconscious, it is better to present pictures in green color.

T

he mind and body are very much integrated; what makes the question – is the mind in the body, or is the body a product of the mind? Both mind and body participate in the same phenomenon of life. The content of the mind is a mixture of process procedures and stored in the unconscious and occasionally processed as conscious mental matter.

The philosophical opinions hold in this matter.

"I am a body."	Materialist.
"I am a mind, and I have a body."	Dualist.
"I am consciousness."	Monistic idealist.

[A Course in Consciousness Stanley Sobottka]

6.5 SEMIOTICS, THE LANGUAGE OF THE BRAIN MAPS.

How is the visual stored and processed?

The reality, whatever it may be, is handled as IMAGES, which can be new perceptual or recalled from the past; even imagination can create an image. Images are neural representations organized topographically and occur in the cortex of the brain — [19}. Images are not of the hardware type memory, but we fabricate ongoing the pictures of the conscious. The brain momentary reconstructs from past fragments an image with a probabilistic accuracy because the inputs come from many sources. PATTERN RECOGNITION is a crucial process in visual neurology. Recognition is similar to the

pattern generation in a CNN model. Neurobiology is a science of recognition, which become very clear in the immunology. An intruder molecular cell is judged on its shape to mobilize the defense.

Science describes vision from two angles: the biological-optical, and the robotic-Artificial Intelligence disciplines. According to Gerard Edelman [113], the principles of neurological vision is framed in the theory of neural group selection called TNGS. Before the mind responses to an incoming pattern, there is a chaos process where CNN configurations evolve to a stable shape out of many options. The neuron patterns are selected from a library. Monkeys have more than 30 maps, such as color, shape, orientation, etc. They can select sheets and compare them with evolutionary value maps like alerts, comfort, etc. Valuations are a form of categorization and belong to the memory function resulting from learning processes. Memory is not hard-wired but a process of a performance repetition. [113 –p82-102]. The precise data format of the sheets' content is unknown. The data can only be measured indirectly by mapping waves and especially the synchronization of the brain waves. Psychological experiments with people and animals search for real-life meaning by the correlations with the brain patterns

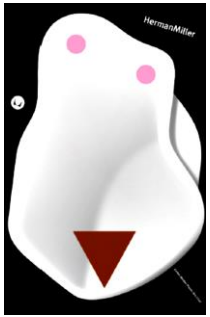
All cognition, such as pattern formation and recognition, and all virtual reality, is generated by brain processes. The virtual reality technology and technical pattern recognition are, as a consequence, a mirror operation of the brain.

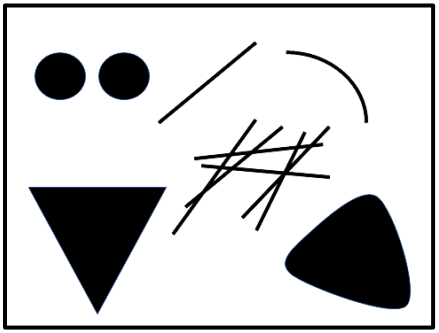
In the next chapter, I elaborate on modern technologies that serve as a blueprint for brain operations. First, let's investigate what Semiotics reveals of the image processing of the brain.

Semiotics is the science of the linkage of mostly graphic data content, its communication, and the psychological effects on persons. The basic principle is the rhythmic generation of - signifier, signified, and sign, which pumps up, transcendences a meaning. Meaning belongs to the domain of the Mind. Images act as building blocks to realize meaning. Pictures are for the Mind macro signs, being made up of simple graphics. The combinations of micro-graphics carry a specific psychological connotation, which is commonly shared by most humans. Stefan Arteni is a contemporary artist who has published much about art and its connection to semiotics. Another reference book is from Wassily Kandinsky titled ' Point and Line to Plane' 1926. In this paper, the artist relates visual art and music, as well as colors, shapes, and orientations. Rhythm in graphics and painting is a repetition in space.

Let me introduce you to the world of graphic design, art, and the visual aesthetic rules of composition, which probably have to do with neurological patterns processed by the brain. I show first an image from the natural scene of a tree and a painting of Herman Miller.







Show the picture of the tree in a Rorchard test, and the chance is significant that the subject associates the image erotically with a naked woman. The perceptual algorithm of the brain offers more solutions derived from the presence of basic graphic patterns, and probably the erotic brain sheets pop up from the instinct to mate. Maybe that Evolution edited neurological catalogs where a set of meanings are attached to graphical subassemblies. Similarly, we conclude the definition of a word

after a brain algorithm checks on the context. The brain processors present several possible valid ideas to the conscious. Psychologists have done a lot in this field (the Rorchard test is an example), and neurologists also published on the brain mechanism when we perceive basic patterns. Although it is hypothetical, the ideas from artists could mirror best the mental processing of images. An excellent guide in this matter is Rudolf Arnheim -[ ], from whom I take over a few statements.

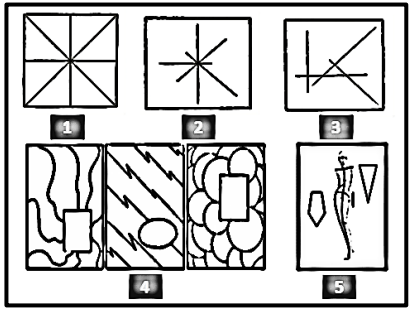
Perception is cognition, and perception of shapes is finding the structural features in it. The mind stores mental templates (s.a. Jungian archetypes) of simple features from which some can trigger instinctual behavior and gestalt figural activities. There is, in principle, no difference between a percept and a concept, and what is right for a form is also valid for colors. In this process of cognition, there is also intelligence, e.g., when a person moves away in the scenery, the visual capture becomes a smaller shape, although we hold in mind the real size constant. Perception always is a focus on a complex, diffuse environment full of noise and context. The process seeks constancy and invariability as a continuity. This is one of the problems of moving pictures in virtual reality.

I give a short technical overview of basic patterns, which might look like a course in drawing. You can speculate on the deeper source of the existence of these patterns,

from which many easily can be linked to Evolution. I did not check on the scientific underpinning of evolutionary underpinning.

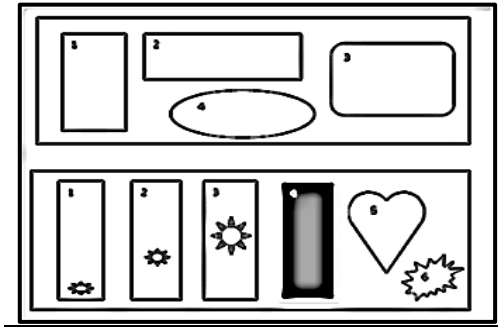
The point is a proto-element with a value depending inside or outside a territory. A point always carries weight.The line is the antithesis to the point and is secondary to the point. A line is not natural and relates to some force.Movement is always a perceptual trigger and can naturally be horizontal or vertical. Horizontal gives a stable hold and is associated with cold. Vertical, up to the sun, is warm and imaginative. In the horizontal movement is the direction most important: toward the viewer or moving away. Our viewing field is 120 degrees left, right and 45 degrees up, down. Such a frame is considered rationale, while a vertical rectangular gives a warm comfort. Compare a banknote and a menu card. Balanced and symmetric provide good feeling. The circle comes on top of the square. An up triangle is a male dominance, and when it points down, it becomes a female symbol. A convex shape is preferable to a concave pattern.Then comes the separate forms into the frame that makes the composition. A huge variety is possible, and that is what the artist explores to create a feeling for him/her self and the viewer. That art carries appreciation points universally to the direction that there is a kind of common neurological algorithm that processes perceptible human data. The power of these algorithms is or everybody different and can be trained. Take the example of abstract art; some people do appreciate it others no at all. Even when the appreciation feeling is conscious, it is difficult to bring it into words. What you hear is usually remarks on basic shapes and composition of lines, shapes, colors, harmony,

attraction, etc. In the alphabet of semiotic graphic shapes, there are also the priority attention for colors and the combination of shapes with colors that create different feelings and appreciations. The link to the Evolution of human mental awareness cannot be proofed, but many explanations sound plausible. For a comprehensive survey, I like to refer to my publication Signs of Life. The life of Signs. [317]. The next map is a graphic illustration of basic shapes and the corresponding connotations.

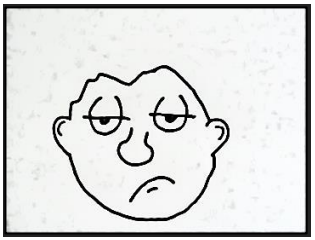


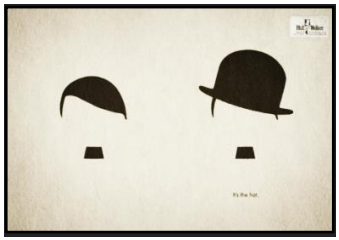
1.Lines bring lyric and make quite.
2.Dramatic expression.
3. Great tension.
4. techniques to attract.
5. The underlying frames. In this case, the female shapes of curves, down triangle, and the pentagram for power and organization.

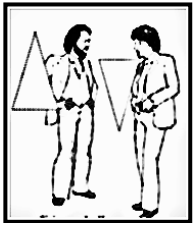




The mind probably reconstructs incoming perceptual data with basic neuro patterns it stores to make a full private version. An artist begins a new painting by sketching frames and iteratively improves them until a stable mental picture corresponds with the wanted imaginary image to express in the conscious sphere. Nature and Evolution have made the neuro processes efficient and effective by the use of a library of basic shapes. A mental mirror of this neuro efficiency can be illustrated with the art of cartoons and cartoon stories, and minimalistic artwork and graphic logo's. A person's character is sketched with a few lines. In the cartoon story, the timeline is made by frames of different shapes, remember the connotation of a horizontal structure versus vertical and how focus, speed, the intensity is realized with simple lines. The hidden frames make the connotations for dominance and submission with the triangles in the next image of the two persons picture 3.







There are many algorithmic procedures the brain executes. The next is an example of a rhythmic process in time.

6.6 THE EVOLUTIONARY CYCLE IN PERCEPTION.

Besides the short emotional cycle processed in perception by the brain, there is a more extended protocol which reproduces the Evolution. When you are confronted with a new view or scenery, the mind runs a checklist, which is part of the alphabet of visual semiotics.

We look around; we see a scenery or picture, we notice something, we look for detais. In this perception process, the attention of our brain follows a specific program with the following steps.

1 The first attraction goes to the things that move. Any movement like linear displacement, rotation, falling, tumble, spiral propagation, catch the mind first, and takes up attention.

2 The next step of the brain is to estimate the distance of the object that is moving. Probably is this a reflex to find out if any danger is prominent, and to prepare the tactic for defense: flight or fight.

3 Now, the following thing happens: we look for stretches of lines. Probably we want to calculate the most and quickest trajectory to flight and check on roadblocks, or a hiding place.

4 A reliable flight path is one that fits the physical capabilities of the hunted and is difficult for the hunter. We check the ground, the background, the shapes and sizes around us, and look for hindrances on the stipulated path.

5 Related to the above, we pay attention to touch: smooth or rough, continuous, porous?

6 Upon the assessment of the environment comes a priority attention to the people in the scene. We first want to see the eyes of the person. Are the eyes closed, or wide open, and what color do we notice? Red eyes are alarming.

7 Once a person is cleared, we turn back to the environment: what is big and what is small. We want to judge whether we can master the obstacles or the objects around us.

8 Next is that we want to find the meaning of the red colors we notice. It is the association to blood or flesh that triggers this attention.

9 Adding to the above emotional signals come the sexual impulse. Is it an opportunity for mating in the air?

10 This is followed by considering whether the scene fits for play, what links to courting rituals.

11 Now we have time, space, and attention to the temperature and breeze.

12 When all seems safe and comfortable, we start imagination, fantasy, and relaxation. We can dream, we discover patterns in the clouds, the stars tell us stories. We hear the birds and notice that the color of strawberries talks sweetness.

13 Once the senses are satisfied, we switch to knowledge. We first analyze people's faces and body language. We look for meaning in everything around us. There is a need for communication and sharing.

14 Now we like to feel comfortable and start looking for beautiful things. We eliminate the ugly objects; we set apart what is clear and what is hidden, old, or new.

15 Upon the choices are made, the ritual, pulsation, and vibrations can start.

16 After the excitement, we need rest and calm. Water is an excellent facilitator.

17 During the relaxation phase, the need for a goal pops up.

18 Now we notice a fire, tunnels, and death. Spiritual thoughts enter.

19 God is claiming his place together with respect for authority.

20 After this, we request rewards and honor. We notice flags and treasures.

21 We become aware that not all are given and that efforts are needed to achieve something.

22 We become aware that we need support. We distinguish groups of people smaller than twenty from the masses of people.

23 Last in the process of perception is that we fall on the faults in the picture; we want to restart all over.

These views come from: Norseen, John D: "Images of Mind: The Semiotic Alphabet" 1996. [313].

The above scenario follows the path of the Evolution of human reflexes. It shows that Evolution is active as a Now moment. The infographic illustration of the evolutionary sequence looks like this:

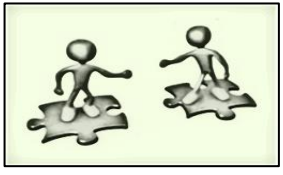




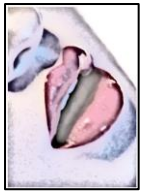


Read the threats and find the escape route — the look for support and cooperation.

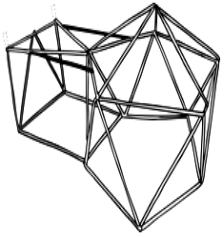




Now the feelings take over.

followed with passion and dreams. Time comes to make plans. And settle.

  ,  Ethics plays a role now, and the material rewards attract and push to more significant challenges.

Failures happen with despair and hope. You decide to



More on the graphic language of our thoughts come from Rudolf Arnheim [316], which is in line with Kandinsky. Here follows a summary of the visual algorithm of perception.

1 The primer points of attraction are the center and the corners. The center dominates what makes that the locations of balance come closer to the edges.

2 Borderlines within the view always create points of attraction or repulsion.

3 Viewing is a dynamic process where the attention jumps between the positions of attraction and repulsion.

4 Points of leverage determine the weight of care in a particular area. These points balance their content of details against more prominent parts or will oppose within the full view.

5 The size of the objects contributes to the weight in the perception, so do colors and the light intensity. For example, the red weight more than blue or green colors.

6 An isolated object in space will logically claim attention.

7 Regular patterns play a more significant role than loose compositions.

8 Next in focus is that vertical weights more than horizontal and oblique.

9 The hidden frame of an arrangement helps to guide the attention.

10 An object in the upper part plays a more prominent role than the same item in the bottom portion. This is also true for the felt side over the right side. These rules are culturally determined linked to the reading process direction; from left to right or the opposite, like in Arabic.

11 We generally pay more attention to what happens on the left-hand side.

12 When making graphic design, you should be aware of the laws of Gestalt. Our brain makes corrections or completes parts of pieces of what we view.

13 The background is as necessary as the target object is in the picture. An unbalance in the background makes you feel uncomfortable, the same is true for the texture of the canvas.

14 Colors and shapes should come in equal groups. For the complementary colors, we refer to the following chapters.

15 When we intuitively make connections between groups of objects, this happens from bottom to top. The soil is the standard base that unites. Splitting and differentiation come from the top.

16 When more objects are displayed, so will the distance between the objects that make part of the associations felt, message, or meaning.

17 Symmetry weights different when it is vertical or horizontal. Vertical balance is more pronounced.

18 That which points to the top inspires and set free; to the bottom asks for explanation and engagement.

19 The action happens horizontal and vision vertical.

There exist other theories about the mental algorithms initiated by perception. One of them is called the ecological approach from Gibson, saying that the cognitive content of the mind confronted with a perception starts filtering the data in the search for elements that point to a possible action. There are instincts, but also the acute biological needs of the body. When you are hungry, you filter food and restaurants first out of the perceptual data.
With these examples, we can reconstruct more or less how the neuro maps create conscious images shared by most humans to a certain degree. Science still has no clue how the neuro hardware-software or wetware creates the wave clouds and how meaning rains from this heaven into the conscious.
To find out more about this, let's study another mirror of reality: how does the current cognition reconstruct the visual function of recognition, via technology.

7 VIRTUAL REALITY, A THE MIRROR OF THE MIND.

7. 1 ABOUT VIRTUAL REALITY.

REALITY is a philosophical issue, and many sciences try to formulate a definition or at least a description of it. In this way, everybody creates their own concept of reality. For this purpose, I follow a version in line with the theories of the brain, mind, consciousness, and cognition, as explained. For most people, a model is only valid when it is logically consistent. In cases like Evolutions, we trust the concept when it reaches a degree of comprehension, providing comfort to the mind. Nobody knows what Reality really is: is it an external physical affair? A mental creation or a mix of both? At least all philosophers agree that we can define Reality as a System being a construct of relations with many dimensions that vary in time. When you doubt that time exists, then assume time as un unknown variable taking part in the relationships.

In line with the continuous highlight of rhythm in all phenomena, I take the definition of Ulam.

In the universe of Ulam, time is the ticking of a clock, and space is a discrete lattice of cells where each cell is occupied by one of a finite number of states as a number, a greyscale. [M.Waldrop 406- P219]. This is the reality seen in patterns that Wolfram describes so well (see chapter 3) and which I have tried to use into the flow of ideas about material life. At any tick of the clock, the next stage is determined by the previous one. The number of rules that can apply is infinite, but in Nature's practics, the resulting patterns do not follow the randomness of rules. Some rules generate patterns that come to a stop, and no change follows. Another category of rules continue to give random patterns without any detectable recurrent image; what is a generator of complete chaos. A class of rules shows repetitive patterns; sometimes, several different stages appear. The most important category of rules is those that replicate a pattern, what we experience in Nature, and which is part of our living reality. So, Reality as a System is a category of generated patterns that reach a stable configuration and which replicates itself in the next step.

We now call our replicating System a biological system. All biological constructs from cells to species are now a dybnamic relational construct. The humans take a previlaged

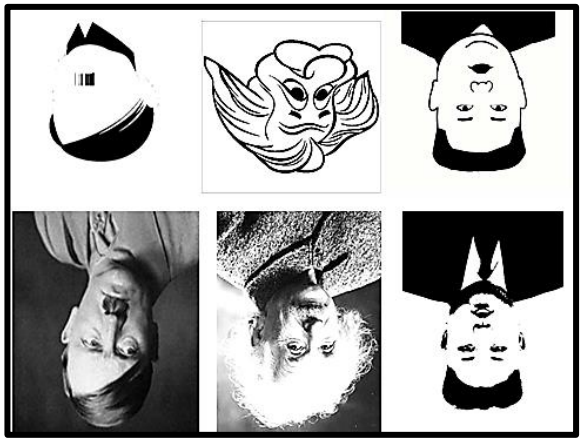
place among the systems because the consciously adjust the relational parameters to improve the system in their advantage. We call this activity TECHNOLOGY that expands the relational activity matrix to an REALITY. The technology is mental and physical. The mental technology defines the rules for the relational pattern. The most effective mental technique is language, which support the relational function of communication. The pysical tools are ample and evolutionists still usage of tools as the demarcaion between animal and human. Mental and physical tools create the AUGMENTED REALITY we live in today. When the sun sets, and it becomes dark, we switch on artificial light to augment vision. Spectacles that expand my visual comfort is a technology which improves the light signals under way to neuro signal data capture. The light signals traveling from the external to the brain undergo many manipulations. The optical eye construct and the nerve-neuron processor put the picture upside down. VIRTUAL REALITY is a subset of Augmented Reality which reformats the Reality System for a purpose like in video games, or with devices that guide you through a museum.

The reality, as a relational system, seeks stable and consistent patterns recognizable by the stored brain maps and does not differentiates wether the input is real or mentally fabricated. From this broad perspective, we consider Augmented Reality as a tool that enhances communication. The brain process patterned information and the macrostructure of this we call Semiotics. In this way, Semiotics is a generator and

manipulator of patterns that frame our lifeworld. But also feelings are translated in data brain maps, think of the emoji. The Reality expanded with augmented realities mixed with real feelings and graphically feeling signs makes it difficult to distinguish the ‘sensed’ reality from the virtual version. Everything becomes intertwined, and the borders between the external and internal fade. In the new version of the Lion’s King, it seems as real animals are staging, and video animated persons are difficult to recognize from real actors. This New Reality is the product of the human mind, and when the brain hardly can differentiate the actual percept from the virtual, it might be that both use the same techniques.

The visual is our most potent sense, and technology has progressed considerably to enhance the capabilities, think of the images from space, and even the birth of the universe. The sens of smell is complemented with chemical spectral analysis for purposes like gas and explosive detection, and smelling for sicknesses have been initiated. The touche sense of robots makes progress. In the audible, since the invention of sound recording, the acoustic experience has improved by digital means. Deficiencies of the hearing organ can be corrected with an electronic chip as an interface to the brain. So what do these technologies suggest as the functioning of the brain?

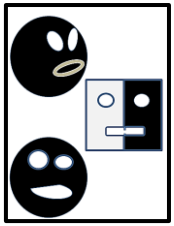
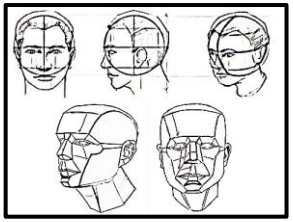
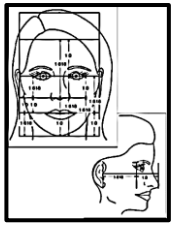
Let's analyze deeper the visual brain processing from the technology of visual recognition. First, what are the data of a human face picture? There are pictural features like shape, direction, and light, structures having explicit shapes and proportions, typification like age and sex, and generic characteristics for groups of people like pious women, and expressive messages. Psychological experiments map several appearances and behaviors which computers can incorporate in the models. Generally, many elements play together and are not easy to segregate, so the data are plentiful and diverse. I show some difficulties scientists encounter as when the pattern is an upside-down face.



Although all proportions and relations between any sub-patterns of an upside-down face remain intact, it is harder to recognize a person, also not is a cartoon drawing. Only specific well-known features put you in the right direction to give a correct answer.

The most practiced parameters in face cognition are the 'Rickett golden ratio proportions,' which also aesthetic surgeons apply to reconstruct or to beautify the patient's face. Ethnic researches map the Rickett parameters to explain the visual appearances of people and gender. These bio-metrical numbers are a basis for all face data processing. The recognition of a face in a group or a crowd is even harder to crack. The technology of face recognition and verification has been growing very fast in the last decades with astonishing results.

The implication on society is now manifest as a big brother always watches and everywhere. The technology used is a clear example of mirroring the human brain. The core ideas are based on the understanding of neuroscience and specifically the visual eye-brain- motoric function. The process checks the aspects: face selection, familiarity check, recognition, emotions, dynamics, and identification. A comparison is made with sets of pictural data containing shapes and the proportions, direction, the light infall, typification of age and gender, and generic characteristics of, e.g., pious women, dominant person, etc. The brain processes all these aspect data serially with iterative routines in search of correlations with templates and previous brain sheets. In parallel, the environmental context is assessed, which creates a mind holistic component



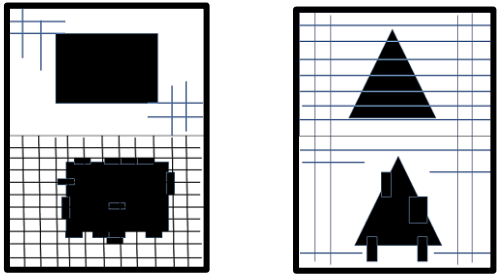




Do not underestimate the holistic aspect of face recognition because the neuro researchers found that the face we store in the brain is related to the experiences we got with that person, the circumstances, emotions, time, etc. We store complementary data which determine and condition our action upon the recognition of the person. [Kevin Bremer] The person's name has its storage allocation what probably explains why the name of our first love biases the connotation with any face having that name.

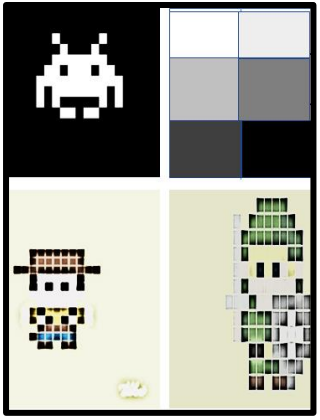
7. 2 FACE RECOGNITION AND ARTIFICIAL INTELLIGENCE

Let's connect back to pattern generation and big data. Finding rules to generate patterns means that we can study what the rules are for a given pattern or at least some mechanisms that create the model. We are back in the field of big data with the question to find regular patterns from a given image. The programmers have templates and proportions to compare within pre-selected frames of the picture. To illustrate the technique, we start with template patterns of a square, a triangle or a most typical face shape template, and compare it with a selected frame from a larger image.



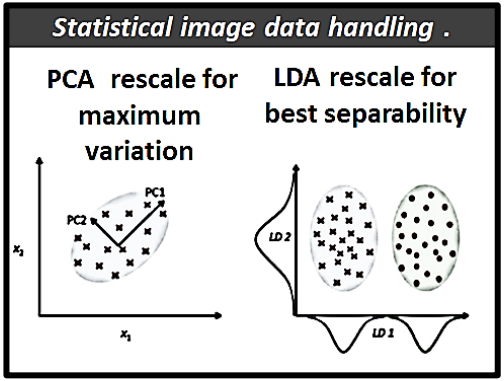
We call an image-frame a digital map with cells organized in rows and columns. The information captured by the eye looks similar. Just like a TV screen where a sequence

of pixels is written line per line, we read the data as a string of digits. In the chapter on pattern generation, we compared the data strings with a sinusoidal pattern that allows reconstructing the pattern as a sum of sinusoidal waves with specific frequency and amplitude (Fourier analysis). In face recognition, we do the same and compare it with the template patterns. Now it is up to statistical data processing to reveal a result. We can choose from several statistical methods. A simple version is called the Principal Component Analysis PCA. It compares all rows or columns with the template and eliminates the variances to keep lesser data and fluctuations. A simplified or normative image is called an eigenvalue of a template, which simplifies the comparison with other images. In this way, you can retain from the many, a set of eigenvalue faces. The image has been reduced to a minimum of data that catches the essential feature of the image.



Another technique is called Linear Discriminant Analysis LDA, which searches from a group of pixels the separates or the separability of the data set. All these techniques become very specialized in line with the many application in pattern handling and

recognition and communication efficiency and reliability. The next picture is an attempt to illustrate the principles of the main statistical tools used.

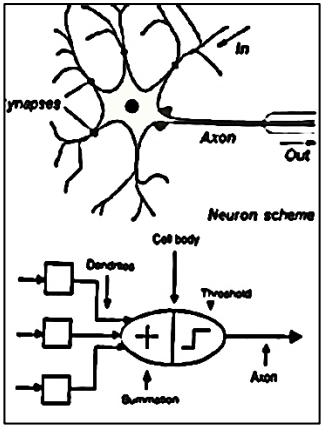


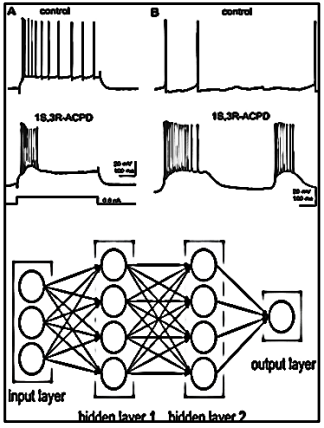
Instead of processing absolute values of measurements, we use the deviations from a fixed norm, which can be the average; or we allocate the measurement data to a class or group and treat these groups separately.

The dynamic studies of brain operation discover more phenomenon ready for more models ever and hypothesize. The concepts presented by the scientists mirror the techniques used from the mathematical complexity models, the visual recognition methods, and the electronic data processing that the engineers run out. It is not clear who leads in the ideas; surely, all progress in neuroscience has a mirror model in complexity management. Take the example of artificial intelligence or automated learning, where the main computational methods are based on neural networks, which

I explained in the version of mental brain maps. The system thinkers like Stephan Wolfram who studied the endless variety of patterns emerging from simple rules. Some rules result in a frozen situation, others never reach a stable configuration, and some rules even reproduce an aesthetic design. In this play of patterns, you hear the echo of Evolution with birth, death, reproduction, and diversification. Why would not the brain process the data gathered from the senses, as a complex network? The name of Neural Network derived from the word neuron indicates synergy between the physical brain and the mathematical networks.

The neuron is the core building block of the brain. Although there exist many kinds of neurons, we can catch the essential operation in a simplified model like electro-engineers practice with logic cells making decisions of AND, OR, NAND, NOR, Delay, FILP-FLOP (memory) and Oscillator. With these logical building blocks, you build a computer. The scientists believing that the brain is a computer, model the brain accordingly with the neuron as a logical cell.





A neuron, as a simplified logical cell with dendrites as inputs and axons as output. Because a neuron acts on intensities, frequencies, and combinations, the model is expanded with more intermediate layers.

In reality, neurons are much more complex in handling the electrical and chemical data, a combination that has no equivalent in technology. The input-patterns play a role in the functioning, there is a wait and see protocol, an emergency reaction, and, most importantly, a self-learning capability, which leads to the many specialized neurons. The interplay with the connecting network is a dynamic process on its own. We find back all these aspects as specialized applications in current advanced technologies from the world. Parallel specialized processors are standard in complex networks, self-learning software, sensors with embedded processors, robotic

movements, and dynamic network configurations. It seems that the concepts of neuroscience mirror the digital models of complex systems and electronic networks – and, or vice-versa. neuron, as a simplified logical cell with dendrites as inputs and axons as output. Because a neuron acts on intensities, frequencies, and combinations, the model is expanded with more intermediate layers.

Neuro-science, as all sciences shape society at the actualized stage in Evolution. The religions claimed, and still do, a soul which helps to establish a social power base. The soul as an independent medium from the body connects to God and is separated from the body, with reunion planned at Judgment Day. René Descartes, who also studied the brain, compromised the religious instruction for separation of soul and body, introduced the notion of conscious and unconscious, managed by God. The conscious became the communication channel to the outside world. [LeDoux].

Later, brain doctors confirmed that the connection with the outside, like speech and behavior, change or disappear when specific brain sectors are damaged. In 1800, anatomist Franz Joseph Gall introduced phrenology or the science of the brain atlas and geography. This connects a person's behavior and character to the brain sections. Gall used the words atlas or geography because, at that period, the scientific center was Europe being a conglomerate of states with conflicting social and political policies.

In 1900 Freud focussed on the individual minds with passions, emotions, and aggression, which trigger social awareness pointing to the individual. The person got rights, which took some more time for women. The long ongoing industrial revolution was succeeded by the age of electro-magnetism with electricity for light and power and the waves for communication.

Hans Berger developed brainwave EEG in 1929, which become the first communication tool with the brain. The brain atlas models were encapsulated in networks, just like the people and societies became interconnected. Lobotomy or cutting nerve connections in the brain to eliminate severe mental issues revealed the highways and the extended network from the brain to toe and fingertips.

The computer from the forties entered the management of business and society; similarly, the brain neurons compare to a digital business processor. Follows the theory of chaos as an attempt to explain the real world that never is stable and that only increase complexity, and loose and even explode or implode. Disturbances in the brain like opiate substances turn the mind crazy. The society grows ever more complex, and Science has to harvest the ideas ever broader and specialized deeper. So happens with neuroscience. Neuropsychology climbs to the same clouds as the neuro-computational sciences participating in the global cloud computing networks. One

strong result of these computational power is now neurogenetics, which can map (dis)orders in an individual brain.

In all this excitement, we should not forget that this is all the work of individual brains operating in individual minds, which connects to other brains as a collective Mind. All the time, we look into a mirror.

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The Brains' *Mind*

The biological brain creates the mental mind,

Today our collective mind becomes so fascinated by its brain source that all sciences incorporate neuro models in their concept. Humankind strives to increase global brainpower with technology.

The most significant discovery is probably philosophical. Such as how the brain creates consciousness. How the brain creates at any moment, it's time, and that at each moment in time, our body runs the whole program of Evolution. Life is a rhythmic ritual.

What we know about the brain is phantasy from the mind.

The Mind's Brain